Contract Documents & Specifications

Flathead Lake Biological Station

Replace Sewer Treatment System
A/E # 2016-01-01-02

February, 2024

Contract Documents

Prepared by:
Anderson-Montgomery
Consulting Engineers
Helena, MT

Set No.

CONTRACT DOCUMENTS
AND SPECIFICATIONS

Flathead Lake Biological Station

Replace Sewer Treatment System

February, 2024

Prepared By: *Adam Eckhart, P.E.*

Checked By: *Paul Montgomery, P.E.*

Anderson-Montgomery Consulting Engineers, Inc.
1064 N. Warren St.
Helena, MT 59601
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Anderson~Montgomery
CONSULTING ENGINEERS

FLATHEAD LAKE BIOLOGICAL STATION
REPLACE SEWER TREATMENT SYSTEM
YELLOW BAY, MT
A/E#2016-01-01-02

TABLE OF CONTENTS

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 2 – EXISTING CONDITIONS, SITEWORK

DIVISION 3 – CONCRETE & GROUT

DIVISION 5 – METALS

DIVISION 7 – THERMAL & MOISTURE PROTECTION

DIVISION 8 – OPENINGS

DIVISION 9 – FINISHES, PAINT & COATINGS

DIVISION 10 – MISCELLANEOUS SPECIALTIES

DIVISION 22 – PLUMBING

DIVISION 23 – HVAC

DIVISION 26 – ELECTRICAL

DIVISION 27 – COMMUNICATIONS

DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

DIVISION 40 – PROCESS INTERCONNECTIONS

DIVISION 43 – PROCESS GAS & LIQUID HANDLING STORAGE EQUIPMENT

DIVISION 46 – WATER & WASTEWATER EQUIPMENT

APPENDICES

BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT

NOTICE

THE CONTRACTOR WILL BE RESPONSIBLE FOR PAYING THE DEPARTMENT OF LABOR AND INDUSTRY BUILDING CODES BUREAU FOR BUILDING, ELECTRICAL, MECHANICAL AND PLUMBING PERMITS.

CONTACT: BUILDING CODES BUREAU
DEPARTMENT OF LABOR & INDUSTRY
301 SOUTH PARK AVENUE
P O BOX 200517
HELENA MT 59620-0517
(406) 841-2056

Updated August 2014

INVITATION TO BID

Sealed bids will be received until the closing time of 2:00 p.m. on ***MARCH 13, 2024,*** and will be publicly opened and read aloud in the offices of the Architecture & Engineering Division, 1520 East Sixth Avenue, P.O. Box 200103, Helena MT 59620-0103, for: ***FLBS REPLACE SEWER TREATMENT SYSTEM / UNIVERISTY OF MONTANA / POLSON, MT / A&E #2016-01-01-02***

Bids shall be submitted on the form provided within the Contract Documents. Contract documents may be obtained at the offices of:

ANDERSON MONTGOMERY
1064 N. WARREN
HELENA, MT 59601
(406) 449-3303 adam@a-mce.com

An Electronic copy of the Contract Documents will be provided at no cost.

A PRE-BID WALK-THROUGH IS SCHEDULED FOR WEDNESDAY, MARCH 6, 2024, AT 11:00 A.M. PARTICIPANTS SHOULD MEET AT THE ENTRANCE TO EXISTING WASTE WATER PLANT AT FLATHEAD BIO STATION LOCATED AT 32125 BIO STATION LANE, POLSON MT. ATTENDANCE IS STRONGLY RECOMMENDED.

Bids must be accompanied by a bid security meeting the requirements of the State of Montana in the amount of 10% of the total bid. After award, the successful bidder must furnish an approved Performance Security and a Labor & Material Payment Security each in the amount of 100% of the contract.

No bidder may withdraw his bid for at least thirty (30) calendar days after the scheduled time for receipt of bids except as noted in the Instructions to Bidders.

The Owner reserves the right to reject any or all bids and to waive any and all irregularities or informalities and the right to determine what constitutes any and all irregularities or informalities.

The State of Montana makes reasonable accommodations for any known disability that may interfere with an applicant's ability to compete in the bidding and/or selection process. In order for the state to make such accommodations, applicants must make known any needed accommodation to the individual project managers or agency contacts listed in the contract documents. Phone 711 for Montana Relay Service services offered. Persons using TDD may call the Montana Relay Service at 1-800-253-4091.

ARCHITECTURE & ENGINEERING DIVISION
DEPARTMENT OF ADMINISTRATION
STATE OF MONTANA

FRONT PAGE HIGHLIGHTS

Note: This list of items is not an exhaustive or all-inclusive list of the contractor's responsibilities for the project but is provided solely for convenience and reference.

ITEM	REFERENCE	GENERAL CONDITIONS
Prevailing Wage Rates	Article 3.4.4 & 16.1	The federal Department of Labor (per the Davis-Bacon Act) and/or the Commissioner of The Montana Department of Labor and Industry (DOLI, 18-2-401 and 18-2-402, MCA) have established the standard prevailing rate of wages to be paid. The Contractor and all subcontractors shall, at minimum, pay the higher rate on a per-trade basis. Regardless of the rate schedule used, certified payroll records are to be submitted to the Owner on a WEEKLY basis.
Warranty	Article 3.5.2	The warranty period shall be defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project.
Schedule	Article 3.10	The Contractor's schedule shall be in the "Critical Path Method" and shall be in a form that is acceptable to the Owner and meet all the conditions of 3.10.
Time Limit on Claims	Article 4.3.1.1	Claims by either party must be initiated within 21 calendar days after occurrence of the event giving rise to such claim.
Weather Delays	Article 4.3.5.2	If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the current critical-path scheduled construction activities.
Waiver of Consequential Damages	Article 4.3.6	The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract.
Mediation & Arbitration	Article 4.5 & 4.6	The parties shall endeavor to resolve their Claims by mediation unless the parties mutually agree otherwise. Claims not resolved by mediation shall be decided by arbitration.
Changes	Article 7.1	Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, or order for a minor change in the Work subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.
Change Order Allowable Costs	Article 7.2.2	As described with a 5% allowance for overhead and a 10% allowance for profit.
Time	Article 8.1.1	Time is of the essence in performance, coordination, and completion of the Work contemplated herein.
Liquidated Damages	Article 8.1.6	The Contractor and his surety shall be liable for and shall pay to the Owner the sums stipulated as liquidated damages for each calendar day of delay until the Work is substantially complete.
Contract Duration/Milestones/Phases	Article 8.1.8	All Work shall reach Substantial Completion by the date(s) listed or within the consecutive calendar days indicated after the start date on the written Notice To Proceed.
Applications for Payment	Article 9.3.2	The Owner has thirty-five (35) calendar days after receipt for approval of the Contractor's Pay Request without being subject to the accrual of interest.
Retainage	Article 9.3.7	Until the Work is complete, the Owner will pay 95% of the amount due the Contractor on account of progress payments. If the Work and its progress are not in accordance with all or any part, piece, or portion of the Contract Documents, the Owner may, at its sole discretion and without claim by the Contractor, increase the amount held as retainage to whatever level deemed necessary to effectuate performance and progress of the Work.
Safety & Protection	Article 10	The Contractor shall be solely responsible for initiating, maintaining and supervising all safety, safety precautions, and safety programs in connection with the performance of the Contract.
Indemnification and Insurance Requirements	Article 11	The Contractor shall indemnify the Owner against the Contractor's negligence. The Contractor shall least carry Workers' Comp, General Liability, Automobile/Equipment, and Property (all-risk) Insurance Coverages as identified. State of Montana shall be listed as an additional insured with copy of ENDORSEMENT provided along with certificates of insurance. No waivers of subrogation shall be accepted.
Performance & Payment Bonds	Article 11.7	The Contract shall furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract. The Contractor shall also furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith.
Payroll & Basic Records	Article 13.8	Payrolls and basic records pertaining to the project shall be kept on a generally recognized accounting basis and shall be available to the Owner, Legislative Auditor, the Legislative Fiscal Analyst or his authorized representative at mutually convenient times. Accounting records shall be kept by the Contractor for a period of three years after the date of the Owner's Final Acceptance of the Project.
Federal Requirements	Article 16	Listing of applicable federal requirements for this project.

STATE OF MONTANA

DEPARTMENT OF ADMINISTRATION

ARCHITECTURE & ENGINEERING DIVISION

1520 EAST SIXTH AVE • PO BOX 200103 • HELENA MT 59620

406.444.3104 • DOAAEDivision@mt.gov • architecture.mt.gov

THIS DEBARMENT FORM MUST BE SIGNED AND SUBMITTED ALONG WITH THE BID PROPOSAL.

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

Project Name: _____

Location: _____

A/E #: _____

TO: DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 EAST SIXTH AVENUE, P.O. BOX 200103
HELENA MT 59620-0103

Government requirements for non-procurement suspension and debarment are contained in the OBM guidance in 2 CFR part 180, which implements Executive Orders 12549 and 12689, Debarment and Suspension. This certification is required by those regulations since the total contract award is expected to equal or exceed $25,000.

By submission of this certification, the individual or firm who is awarded this contract certifies that neither the individual or firm and its principals nor their subcontractors and their principals: (1) are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from the award of contracts by any federal department or agency; (2) have within a 3-year period preceding any partially or wholly federally funded contract been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) contract or subcontract; been in violation of federal or state antitrust statutes, or been convicted of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in (2) above; and, (3) have within a 3-year period preceding an award of any partially or wholly federally funded contract, had one or more contracts terminated for cause or default by any federal or state agency.

_____
Company

_____
Name and Title of Authorized Representative

_____
Signature Date

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this proposal, the prospective lower-tier participant is providing the certification.

2. The certifications in this clause are a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower-tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the federal government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower-tier participant shall provide immediate written notice to the offices to which this proposal is submitted if at any time the prospective lower-tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms “covered transaction,” “debarred,” “suspended,” “ineligible,” “lower-tier covered transaction,” “participant,” “person,” “primary covered transaction,” “principal,” “proposal” and “voluntarily excluded,” as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the offices to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower-tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower-tier covered transaction with a person who is debarred, suspended, declared ineligible or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower-tier participant further agrees by submitting this proposal that it will include this clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion–Lower- Tier Covered Transaction,” without modification, in all lower tier covered transactions and in all solicitations for lower-tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower-tier covered transaction that it is not debarred, suspended, ineligible or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower-tier covered transaction with a person who is suspended, debarred, ineligible or voluntarily excluded from participation in this transaction, in addition to other remedies available to the federal government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

TITLE 18. PUBLIC CONTRACTS
CHAPTER 1. PUBLIC CONTRACTS GENERALLY
Part 1. Preferences and General Matters

Hiring Preference For Residents Of Indian Reservations For State Construction Projects Within Reservation -- Rules

18-1-110. Hiring preference for residents of Indian reservations for state construction projects within reservation -- rules. (1) For any contract awarded by a state agency for a state construction project within the exterior boundaries of an Indian reservation, except a project partially funded with federal-aid money from the United States department of transportation or when residency preference laws are specifically prohibited by federal law, there must be inserted in the bid specification and the contract a provision, in language approved by the commissioner of labor and industry, implementing the requirements of this subsection. The bid specification and the contract must provide that a preference in hiring for positions of employment be given to Indian residents of the reservation who have substantially equal qualifications for any position. For the purposes of this section, the definitions in **2-18-111** apply.

(2) The commissioner of labor and industry shall enforce this section, investigate complaints of its violation, and may adopt rules to implement this section.

History: En. Sec. 2, Ch. 506, L. 1991.

CONFEDERATED SALISH AND KOOTENAI TRIBES
INDIAN PREFERENCE ORDINANCE REGULATIONS

Statutory Authority
These rules are issued pursuant to the authority granted to the Indian Preference Office by the Tribal Council pursuant to Ordinance 101A.

Statement of Purpose
The intent of Tribal Ordinance 101A is to facilitate full employment of Indian people on the Flathead Reservation by promoting Indian economic self-sufficiency through the granting of preference to qualified Indian employees and qualified Indian-owned entities whenever consistent with Federal Law.

Implementation of Specific Indian Preference Requirements
Partners, owners, and managerial employees of contracting firms shall be employed only in management or supervisory positions. The employment preference provisions of Tribal Ordinance 101A and these regulations apply to all other employees.

Indian Preference Employment
Tribal Ordinance 101A and its implementing rules apply to all contracts subject to the Indian Self-Determination Act. (See *Dawavendewa v. Salt River Project* 1998 WL. 605282 (9th Cir.)). The following order of preference applies to the hiring of employees unless prohibited by federal law:

A. First preference shall be given to enrolled members of the Confederated Salish and Kootenai Tribes.

B. Second preference shall be given to enrolled members of any other federally recognized tribe.

C. All others.

Indian Preference Business Certification
A contractor or subcontractor seeking certification as an Indian Preference Business must make application on a form available from the Indian Preference Office and is subject to the following rules:

A. The entity must submit the application and required documentation to the Indian Preference Coordinator, whose decision on the application shall constitute a final decision for the purpose of satisfying administrative process.

B. The entity must renew certification on an annual basis to remain eligible for Indian Preference.

Indian Preference in Contracting and Subcontracting
Preference in the awarding of contracts and subcontracts and in the procurement of services, materials, supplies, and equipment required for work to be performed shall be given to certified Indian-owned businesses as follows unless prohibited by Federal Law:

A. First Preference shall be given to a CSKT member-owned business which is a responsible bidder with a responsive bid. Such CSKT member-owned business coming within 10% of the low bid or price quote shall have the opportunity to meet the low figure.

B. Second preference shall be given to any other Indian-owned business which is a responsible bidder and which submits a responsive bid. Any such other Indian-owned business coming within 10% of the low bid or price quote shall have the opportunity to meet the bid or price if no CSKT member-owned business does so.

Hiring Hall
The Indian Preference Office provides a referral service for applicants seeking work and contractors looking for eligible Indian employees on the Reservation.

A. The following rules apply to workers:

1. Workers seeking employment must send in a postcard on a monthly basis to insure their name is referred to contractors.

2. Workers no longer seeking employment must notify the Indian Preference Office.

3. Workers must renew the application they have on file in the Indian Preference Office annually, in order to remain in the active referral file.

4. Non-Indian employees may not start work without approval of the Indian Preference Office.

The following rules apply to employers:

5. The Indian Preferences Office shall be given a twenty (24) hour time period to furnish a qualified referral. However, the twenty four (24) time period may be waived in cases of emergency as determined by the Indian Preference Coordinator.

6. If the Indian Preference Office is unable to locate a qualified Indian and the Indian Preference Coordinator has certified to this fact in writing, a contractor may be granted an employment waiver.

7. Employers may not use job qualification criteria or personnel requirements which bar Indians from employment, unless such criteria or requirements

are justified by business necessity. Such criteria must be justified in writing to then Indian Preference Office prior to implementation. The Indian Preference Coordinator and individual employers shall have the responsibility to determine whether an employee is qualified for a job craft or skill. The burden of proof shall be on the employer in all disputes of minimum qualifications standards and on termination of Indian preference employees when as employer determines the individual is not qualified.

Contracting Fee

A prime contractor shall be assessed a one time fee of 3% of the bid for any contract over $ 25,000.00. The contractor shall pay one half of the fee prior to starting work on the Flathead Indian Reservation, and the remaining half upon completion of the contract.

Employment Compliance Plan

Every contractor and subcontractor must submit a written compliance plan to the Indian Preference Coordinator prior to commencing work.

A. The plan shall be submitted on a form provided by the Indian Preference Office.

B. The plan must be submitted and approved ten days before work begins.

C. The prime contractor will be responsible for monitoring all relevant subcontractors for compliance.

D. The Indian Preference Coordinator is authorized to make on-site inspections as necessary.

Reports

The following reporting requirements apply to every contractor and subcontractor having a contract over $25,000.00:

A. Project Payroll Reports (wage and hour reports) must be submitted to the Indian Preference Office within one week after payroll disbursement.

B. Disciplinary action taken must be reported to the Indian Preference Office within two (2) working days.

C. Promotions must be reported to the Indian Preference Office within two (2) working days.

D. Terminations must be reported to the Indian Preference Office within 24 hours, followed within one week by a written explanation of the termination.

E. Lay-offs must be reported to the Indian Preference Office 24 hours in advance. In all lay-offs and reductions in workforce, no Indian worker shall be terminated if a non-Indian worker in same job classification is still employed.

Payroll Hours
All Indian preferences employees will be given the same number of work hours and overtime hours as non-Indian co-workers.

Fringe Benefits
Any Indian employee shall have the right to receive any health insurance or pension benefits (fringe benefits) paid to them directly at the time they receive their regular paycheck. Any employer who refuses to comply with this provision shall be guilty of a violation of the Indian Preference Ordinance.

Collective Bargaining Agreements
Entities having collective bargaining agreements with a union shall comply with Tribal Ordinance 101A and these rules.

Formal Training
The Tribes encourage training programs developed and administered by an employer with the assistance of the Indian Preference Office. Under Davis-Bacon projects, this program shall be U.S. Department of Labor, Bureau of Apprenticeship and Training certified.

Notice of Non-Compliance
When the Indian Preference Coordinator has reason to believe that entity is out of compliance with Ordinance101A or these rules, the Indian Preference Coordinator shall issue notice of noncompliance to the alleged violator.

Such notice shall be served either personally or by registered or certified mail, and shall constitute a summons and complaint for purposes of the violation.

The notice shall state the nature of the alleged violations, the type of sanction that may be assessed for each alleged violation, the right to answer, and the consequences of failing to answer. The notice may provide an opportunity to cure the alleged acts of non-compliance, and if so, the method and time for cure. The notice shall specify the date and place at which a hearing on each alleged violation will be held if the alleged violation is not cured. Such hearing shall be held no less then 30 days or more than 60 days after the date of service of a notice.

Answer
A person who receives a notice of noncompliance shall answer within 15 days of the date of receipt of the notice. The answer shall be personally served or mailed to the Indian Preference Coordinator by registered or certified mail. An answer shall either admit or deny the violation(s), raise all affirmative defenses, and state whether the entity will undertake curative measures, if any, specified in the notice of noncompliance.

If an answer states that a person will undertake all curative measures specified in the notice, the hearing scheduled in the notice may be held in abeyance for a reasonable amount of time to enable completion of the curative measures.

If curative measures are completed within a reasonable time and to the satisfaction of the Indian Preference Coordinator, the hearing may be canceled at the Indian Preferences Coordinator's discretion. Satisfactory completion of curative measures shall not prevent the imposition of fines or penalties.

Sanctions
The Indian Preference Coordinator is authorized to recommended imposition of sanctions from the following list against any person or entity who is found to be in violation of Ordinance 101A and its implementing regulations:

A. Make changes in procedures and policies necessary to eliminate the violations;

B. Suspend all operation subject to ordinance 101A, and/or prohibit engagement in future operations to which Ordinance 101A applies until the identified violation is corrected;

C. Withhold from final payment to the general contractor 20% of the total amount of the relevant contract under which a violation occurs;

D. Deny the rights to commence or business to which Ordinance 101A applies;

E. Order any other provision the Coordinator deems necessary to eliminate the violations.

Grievance Procedure
The Tribal Administrative Procedures Ordinance (TAPO) shall provide the procedures for administrative and judicial review of all final orders arising under Ordinance 101A.

Chief Executive Officer
As applied in Ordinance 101A, the "Chief Executive Officer" referenced in part VI, Section 25 of TAPO shall be the Indian Preference Coordinator.

Revised: February 5, 2009

INSTRUCTIONS TO BIDDERS

1. Table of Contents

2. Viewing of Contract Documents

2.1. The Contract Documents may be viewed at all Montana Plans Exchanges.

3. Contract Documents

3.1. Any question regarding the documents must be directed at the office of the Architect/Engineer:

Anderson Montgomery
1064 N. Warren
Helena, MT 59601
(406) 449-3303 adam@a-mce.com

4. Visits to Site

4.1. Prospective bidders are requested to contact the following for inspection of the site:

Eric Anderson
University of Montana – Flathead Bio Station
32125 Bio Station Lane
Polson, MT 59860
(406) 872-4501 eric.anderson@flbs.umt.edu

4.2. Failure to visit site will not relieve the Contractor of the conditions of the contract.

5. Requests for Substitution

5.1. Any requests for product substitution must be made to the Architect/Engineer at least ten (10) calendar days prior to the date of the bid opening for consideration by the Architect/Engineer. Any request for substitution made after this time restriction, including those made after award or

during project construction, may be rejected without consideration by either the Architect/Engineer or the Owner.

6. Bids/Proposals

6.1. The bidder shall submit his bid on the Bid Proposal Form furnished with the Contract Documents.

6.2. DO NOT send the Contract Documents with the Proposal.

6.3. If the project is funded by any portion of federal funds, the following may apply: on certain federally funded projects, a "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion" form must be submitted with the bid proposal. If the debarment form is not included within the Construction Documents, federal funds (if included) do not require the form or are not included in the project and the debarment form is not required.

6.3.1. If federal funds are included and require the “Certification,” no award may be made to a Contractor or any subcontractor that is federally debarred, suspended or proposed for debarment in accordance with Public Law 103-355, Section 2455 (31 USC 6101) and Executive Order 12689. The Contractor who is awarded this contract shall certify that neither the contractor, its principals, their subcontractors nor their principals: (1) are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from the award of contracts by any federal department or agency; (2) have within a 3-year period preceding any partially or wholly federally funded contract has been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) contract or subcontract; been in violation of federal or state antitrust statutes, or been convicted of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in (2) above; and, (3) have within a 3-year period preceding an award of any partially or wholly federally funded contract, had one or more contracts terminated for cause or default by any federal or state agency.

6.4. Proposals shall be in a sealed envelope and addressed to:

Department of Administration
Architecture & Engineering Division
Metcalf Building, Room 3
1520 East Sixth Avenue
P.O. Box 200103
Helena MT 59620-0103

6.5. The envelope shall state that it contains a “BID PROPOSAL” and indicate the following information:

Name of Project:

Location:
A/E Project Number**:**
Name of Bidder: _____
Acknowledge Addendum Number: __, __, __, __,

6.6. It is the bidder’s responsibility to deliver or ensure delivery of the bid proposal to the office of the Architecture & Engineering Division. Proposals received after the scheduled closing time for bids by either the bidder, a delivery service (e.g., Federal Express, U.S. Postal Service, United Parcel Service, etc.), or the state’s own mail delivery system, will be rejected. Proposals entitled for consideration must be time-stamped in the Owner’s office prior to the closing time for receipt of bids. The official time clock for receipt of bids is the Owner's time and date stamp clock located in the Owner’s office. No other clocks, calendars or timepieces are recognized. All bidders are responsible to ensure all bids and fax, or email modifications are received in the Owner’s office prior to the scheduled closing time.

6.7. If requested on the Bid Proposal Form, any person making a bid to perform the work shall, as a requirement of a responsible bid, set forth the name of each subcontractor specified in the "List of Subcontractors" which is part of the bid proposal. The bidder shall list only one subcontractor for each such portion of work listed. The bidder whose bid is accepted shall not:

6.7.1. Substitute any other subcontractor in place of the subcontractor listed in the original bid, except by specific consent of the Owner. The Owner, at its sole discretion, may grant substitution with consent of the originally listed subcontractor, or in consideration of other factor(s) involved if deemed relevant to the successful performance of the Contract.

6.7.2. Permit any such subcontract to be voluntarily assigned, transferred or allow it to be performed by any party other than the subcontractor listed in the original bid without the consent of the Owner.

6.8. Bid Proposals entitled to consideration shall be made in accordance with the following instructions:

6.8.1. Made upon form provided.
6.8.2. All blank spaces properly filled.
6.8.3. All numbers stated in both writing and in figures.
6.8.4. Shall contain no additions, conditional or alternate bids, erasures or other irregularities.
6.8.5. Shall acknowledge receipt of all addenda issued.

6.9. Bid Proposals entitled to consideration shall be signed by the proper representative of the firm submitting the proposal as follows:

6.9.1. The principal of a single owner firm.
6.9.2. A principal of a partnership firm.
6.9.3. An officer of an incorporated firm, or an agent whose signature is accompanied by a certified copy of the resolution of the Board of Directors authorizing that agent to sign.
6.9.4. OR, other persons signing for a single-owner firm or a partnership shall attach a power-of-attorney evidencing his authority to sign for that firm.

6.10. UNIT PRICES: When a Bid Proposal Form contains unit prices, any errors discovered in the extension of those unit prices will be corrected by the Owner using the unit price figures. The adjusted extended amount will then be used to determine the correct total bid. Only after the amounts have been checked and adjusted, if necessary, will the valid low bid be determined.

6.11. ESTIMATED QUANTITIES: All estimated quantities stipulated in the Bid Proposal and other Contract Documents are approximate and are to be used only as a basis for estimating the probable cost of the work and for the purpose of comparing proposals submitted for the work. It is understood and agreed that the actual amounts of work done, and materials furnished under unit price items may vary from such estimated quantities. The actual quantities will depend on the conditions encountered at the time the work is performed.

6.12. Any bidder may modify his bid by fax or email communication only.

6.12.1. It is the bidder’s responsibility to ensure that the entire modification is received at the bid opening location prior to the scheduled closing time for receipt of bids. The modification shall not reveal the bid price but shall only provide the ADDITION or SUBTRACTION from the original proposal.
6.12.2. The Owner is not responsible for the performance of the facsimile/printer machine, maintaining adequate paper levels, toner levels, the telephone connection, quality of the facsimile, or any other factors affecting receipt of the fax. Unreadable or difficult-to-read facsimiles may be rejected at the sole discretion of the Owner.
6.12.3. The Owner is not responsible for the performance of the State’s system or any other factors affecting receipt of the email. Unreadable or difficult-to-read modifications may be rejected at the sole discretion of the Owner.
6.12.4. Changes in the listed subcontractors, if any, shall also be provided.
6.12.5. Bid modifications must be verified by hard copy provided to the Owner within two (2) business days after the bid opening.

6.12.6. Bid modifications shall be directed to and only to fax phone (406) 444-3399 or email aebids@mt.gov.

6.12.7. All facsimiles shall be date and time stamped on the same time-stamp clock in the Owner's office that is used for receipt of bids in order to be considered valid. The Owner may also use the date and time on the automatically generated email notification of facsimile receipt as generated by the State's system. Any date and time indicated at the top of the facsimile on either the bidder's or the Owner's facsimile/printer machine will not be used in determining time of arrival of the modification.

6.12.8. All emails shall be date and time stamped on the same time-stamp clock in the Owner's office that is used for receipt of bids in order to be considered valid. The Owner may also use the date and time on the email notification as generated by the State's system. Any date and time indicated on the bidder's computer will not be used in determining time of arrival of the modification.

6.13. In the event of a discrepancy on the bid proposal between the written (alpha) numbers and the numeric numbers, the lowest figure will prevail.

6.14. The Owner reserves the sole right to reject any or all bids and to waive any irregularities or informalities. The Owner also reserves the sole right to determine what constitutes irregularities or informalities and/or what is material and/or immaterial to the bids received.

6.15. Bid results will posted on the Architecture & Engineering Division website at https://architecture.mt.gov/.

7. Bid Security

7.1. IF THE PROJECT COST IS LESS THAN $150,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE BID SECURITY (18-2-302 MCA).

7.2. All proposals shall be accompanied by a bid security in the amount of 10% of the bid price, as evidence of good faith (18-2-302 MCA).

7.3. Bid security shall be in the form of lawful moneys of the United States, cashier's check, certified check, bank money order or bank draft, irrevocable letter of credit, bid bond or bonds payable to the State of Montana (18-2-302 MCA). Original document(s) must be submitted with the bid. Photocopies will not be accepted and will result in rejection of the bid.

7.4. If the bidder, to whom a contract is awarded, fails to enter into and execute the proposed contract within fifteen (15) calendar days of award, the bidder shall forfeit the bid security (18-1-204 MCA).

7.5. The bid security of unsuccessful bidders will be returned when the contract has been awarded to the successful bidder or when all bids have been rejected (18-1-205 MCA).

7.6. Execution of and entering into a contract includes providing all necessary insurance certificates, bonds, signed contract and current copy of the construction contractor registration certificate or registration number.

7.7. **NOTE: PER STATE POLICY, IF CASH, CHECK, MONEY ORDER, OR BANK DRAFT ARE PROVIDED AS BID SECURITY, IT WILL BE DEPOSITED IN THE TREASURY. UNSUCCESSFUL BIDDERS WILL HAVE THEIR SECURITY RETURNED UPON CONTRACT AWARD. THE SUCCESSFUL BIDDER'S SECURITY MAY BE RETURNED UPON ISSUANCE OF NOTICE TO PROCEED.**

8. Withdrawal of Bids

8.1. Any bidder may withdraw his bid proposal at any time prior to the scheduled closing time for the receipt of bids.

8.2. Once the closing time for the receipt of bids is reached, a bid may not be withdrawn for a period of thirty (30) calendar days.

8.3. The official time clock for receipt of bids and fax or email modifications is the Owner's time and date stamp clock located in the Owner's office. No other clocks, calendars or timepieces are recognized. All bidders are responsible to ensure all bids and fax, or email modifications are received in the Owner's office prior to the scheduled closing time.

9. Interpretation of Contract Documents

9.1. Bidders shall promptly notify the Architect/Engineer of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents or of the site and local conditions.

9.2. Bidders requiring clarification or interpretation of the Contract Documents shall request, in writing, clarification from the Architect/Engineer at least ten (10) calendar days prior to the date set for receipt of bids.

9.3. Any interpretations, corrections, or change in the Contract Documents prior to the bid opening will be made by written addendum issued by the Architect/Engineer. The Architect/Engineer will endeavor to notify all plan holders of any addenda issued but it shall be the responsibility of the individual bidders to insure they have received all addenda prior to the submission of their bid.

9.4. All written addenda issued by the Architect/Engineer will become part of the Contract Documents and all bidders shall be bound by such addenda whether or not received and/or acknowledged by the bidder. No oral or telephone modifications of the Contract Documents will be considered or allowed.

10. Award of Bids

10.1. All bids received by the stated hour will be opened and publicly read aloud.

10.2. The Owner reserves the right to reject any and all bids and to waive any informality or irregularity in any bid received. The Owner reserves the right to determine what constitutes material and/or immaterial informalities and/or irregularities.

10.3. The low bid shall be determined on the basis of the lowest Base Bid or the lowest combination of Base Bid and Alternate Bids, accepted in consecutive order.

10.4. The Owner shall award such contract to the lowest responsible bidder (18-1-102 MCA).

10.4.1. The Owner may make such investigations as it deems necessary to determine whether or not any or all bidders are responsible.
10.4.2. The term "responsible" does not refer to pecuniary ability only, nor the ability to tender sufficient performance and payment bonds.
10.4.3. The term "responsible" includes, but is not limited to:
10.4.3.1. Having adequate financial resources to perform the contract or the ability to obtain them.
10.4.3.2. Being able to comply with the required delivery, duration, and performance schedule.
10.4.3.3. Having a satisfactory record of integrity and business ethics.
10.4.3.4. Having the necessary organization, experience, accounting, and operational controls.
10.4.3.5. Having the necessary production, construction, technical equipment, and facilities; and,
10.4.3.6. Having the technical skill, ability, capacity, integrity, performance, experience, lack of claims and disputes, lack of actions on bonds, lack of mediations, arbitrations and/or lawsuits related to construction work or performance, and such like.
10.4.4. Bidders shall furnish to the Owner all information and data for this purpose as the Owner may request.
10.4.5. The Owner reserves the right to reject any bid if the investigation or evidence of any Bidder fails to satisfy the Owner that such Bidder is properly and adequately qualified to suitably perform and satisfactorily execute the obligations of the Contract and Work

defined in the Contract Documents.

10.5. The Owner shall award such contract to the lowest responsible bidder without regard to residency except on a reciprocal basis: a resident bidder will be allowed a preference on a contract against the bid of any non-resident bidder from any state or country that enforces a preference for resident bidders. The preference given to resident bidders of the State of Montana must be equal to the preference given in the other state or country (18-1-102, MCA). This does not apply when prohibited by federal requirements.

10.6. The Department of Administration may negotiate deductive changes, not to exceed 15% of the total cost of the project, with the lowest responsible bidder when the lowest responsible bids causes the project cost to exceed the appropriation; or with the lowest responsible bidders if multiple contracts will be awarded on the projects when the total of the lowest responsible bids causes the project cost to exceed the appropriation. A bidder is not required to negotiate his bid but is required to honor his bid for the time specified in the bidding documents. The Owner may terminate negotiations at any time (18-2-105(8) MCA).

10.7. Receipt of the award does not constitute a contract and no work may begin until a contract signed by all parties is in place.

11. Contract

11.1. The sample Standard Form of Contract between Contractor and Owner, as issued by the Owner, will be used as the contracting instrument and is bound within the Contract Documents.

11.2. The form shall be signed by a proper representative of the bidder as defined above in these instructions.

11.3. The Contractor shall also complete and return federal form W-9 along with the Contract.

11.4. Work under the contract may begin only when the contract is signed by all parties.

12. Performance, Labor and Material Payment Security

12.1. IF THE PROJECT COST IS LESS THAN $150,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE A PERFORMANCE OR LABOR AND MATERIAL PAYMENT SECURITY (18-2-201 MCA).

12.2. THE CONTRACTOR SHALL PROVIDE BOTH SECURITIES FOR THIS PROJECT AS SPECIFIED BELOW, UNLESS SPECIFICALLY DIRECTED THAT THIS REQUIREMENT HAS BEEN WAIVED ELSEWHERE IN THESE DOCUMENTS.

12.3. The Owner shall require the successful bidder to furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract (18-2-201, MCA).

12.4. The Owner shall require the successful bidder to furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith (18-2-201 MCA).

12.5. The bonds shall be executed on forms furnished by the Owner. No other forms will be acceptable.

12.6. The bonds shall be signed in compliance with state statutes.

12.7. Bonds shall be secured from a state-licensed bonding company.

12.8. Power of Attorney

12.8.1. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
12.8.2. One original copy shall be furnished with each set of bonds.

12.8.3. Others furnished with a set of bonds may be copies of that original.

13. Notice to Proceed

13.1. The successful bidder who is awarded the contract for construction will not be issued a Notice to Proceed until there is a signed Contract, the specified insurance certificates, completed bond forms, federal form W-9, a copy of the bidder's current Construction Contractor Registration Certificate in the Owner's possession. All items are required within fifteen (15) calendar days of contract award made by the Owner. No work may begin until a contract signed by all parties is in place.

14. Laws and Regulations

14.1. The bidders' attention is directed to the fact that all applicable federal and state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over the project shall apply to the contract throughout and will be deemed to be included in this contract as if bound herein in full.

15. PAYMENTS

15.1. NOTICE OF APPROVAL OF PAYMENT REQUEST PROVISION. Per Title 28, Chapter 2, Part 21, this contract allows the Owner to change the number of days to approve a Contractor's payment request. This contract allows the Owner to approve the Contractor's payment request within thirty-five (35) calendar days after it is received by the Owner without being subject to the accrual of interest.

16. BUY SAFE MONTANA PROVISIONS

16.1. The successful bidder who is awarded the contract for construction shall provide their incident rate, experience modification ratio (EMR) and loss ratio via the Buy-Safe Montana form with the Award documents.

BID PROPOSAL

FLBS REPLACE SEWER TREATMENT SYSTEM
UNIVERSITY OF MONTANA – FLATHEAD BIO STATION
POLSON, MONTANA
A/E #2016-01-01-02

TO:
Director, Department of Administration
Architecture & Engineering Division
1520 East Sixth Avenue
P.O. Box 200103
Helena, Montana 59620-0103

The undersigned, having familiarized himself with the Contract Documents, site, location, and conditions of the Work as prepared by ***ANDERSON MONTGOMERY, 1064 NORTH WARREN, HELENA MT 59601, 406 449-3303, adam@a-mce.com;*** by submission of this Bid Proposal, hereby agrees to complete the Work for the total sum as follows:

BASE BID:

_____
(Bid Price in ALPHA notation)

_____ and _____ /100 DOLLARS

$_____
(Bid Price in NUMERIC notation)

This bidder acknowledges receipt of the following addenda:

ADDENDUM #: _____ Dated: _____

ADDENDUM #: _____ Dated: _____

ADDENDUM #: _____ Dated: _____

Company Name: _____

Signature: _____

Print Name: _____

Title: _____
(verify signatory requirements with Instructions To Bidders, Paragraph 6.9)

Business Address: _____

_____

_____

e-mail Address: _____

Phone #: _____

Fax #: _____

MT Contractor Registration #: _____

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT
59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

STANDARD FORM OF CONTRACT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION

THIS CONTRACT IS SUBJECT TO ARBITRATION PURSUANT TO THE UNIFORM ARBITRATION ACT, MCA TITLE 27, CHAPTER 5

This **CONTRACT** is made as of: ***DATE***

BETWEEN:

FIRM NAME
ADDRESS
CITY, STATE, ZIP
PHONE # / E-MAIL

Hereinafter identified as the "**CONTRACTOR**" and the State of Montana, acting through its Director, Department of Administration, hereinafter identified as the "**OWNER**":

Department of Administration, State of Montana
P.O. Box 200103, 1520 East Sixth Avenue
Helena, MT 59620-0103

WITNESSETH that the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE 1 – SCOPE OF WORK
The Contractor shall perform all Work as shown in the Contract Documents entitled:

FLBS REPLACE SEWER TREATMENT SYSTEM
UNIVERSITY OF MONTANA – FLATHEAD BIO STATION
POLSON, MONTANA
A/E PROJECT #2016-01-01-02

As prepared by:

ANDERSON MONTGOMERY
1064 N. WARREN
HELENA, MT 59601
406 449-3303 adam@a-mce.com

Hereinafter identified as the "**ARCHITECT/ENGINEER**."

ARTICLE 2 – TIME OF COMPLETION
As time is of the essence in performance, coordination, and completion of the Work contemplated under this Contract, the Work to be performed shall commence on a date set forth by the Owner in a written "Notice To Proceed" and shall be completed WITHIN:

Start work on site **AUGUST 12, 2024** and be completed with work by **DECEMBER 10, 2024**

If the Work is not completed within the time specified, the Owner may assess liquidated damages in the amount of:

THREE HUNDRED AND NO/100 DOLLARS ($300.00) PER CALENDAR DAY OF DELAY.

ARTICLE 3 – CONTRACT SUM
The Owner shall pay the Contractor for performance of the Work, subject to additions and/or deductions by Change Order or damages as provided in the Contract Documents, the Contract Sum of:

ARTICLE 4 – PROGRESS PAYMENTS
The Owner shall make payments on account in accordance with the Contract Documents as follows: Ninety-Five (95%)

of the portion of the Contract Sum for labor, materials, and equipment incorporated in the Work and for materials suitably stored. The Contractor shall be aware that the Owner has thirty-five (35) calendar days upon receipt in which to make approval and payment without being in violation of statute or being subject to the accrual of interest shall, or the need to make written notice or justification to deny payment in whole or in part. The Contractor shall, within seven (7) calendar days following receipt of payment from the Owner, make payment to subcontractor(s).

ARTICLE 5 – FINAL PAYMENT

Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor when: 1) the Work is completed in accordance with the Contract Documents; 2) the Contract fully performed; 3) a final Form 101, Periodic Estimate for Partial Payment showing the final correct amounts is approved by the Architect/Engineer; 4) a Form 106, "Contractor's Affidavit of Completion, Payment of Debts and Claims, and Release of Liens" is completed and submitted; and 5) a Form 103, "Consent of Surety Company To Final Payment" is completed and submitted.

ARTICLE 6 – CONTRACT DOCUMENTS

The Contract Documents, together with this Contract, form the entire Contract and Agreement between the Contractor and Owner. The Contract Documents, which are totally and completely a part of this Contract as if attached hereto or repeated herein, are enumerated in the General Conditions of the Contract for Construction inclusive of Wage Rates, Reports, and all other items bound with the Specifications and/or Project Manual(s).

ARTICLE 7 – PREVAILING WAGE SCHEDULE

The Contractor and all subcontractors at any tier or level shall, as a minimum, pay the standard prevailing rate of wages schedule (including per diem, fringe benefits for health, welfare, and pension contributions and travel allowance) in effect and as applicable to the district in which the Work is being performed.

ARTICLE 8 – VENUE

In the event of any mediation, arbitration, or litigation concerning any matter or dispute arising out of or related to the Contract, venue shall be the First Judicial District in and for the County of Lewis and Clark, Montana. The Contract shall be interpreted and subject to the laws of the State of Montana.

EXECUTION OF THIS CONTRACT

This Contract is entered into as of the day and year first written above:

Contractor:

_____
Signature

_____
(print name)

_____
Title

Is this company incorporated? Yes _____ No_____

Owner:

DEPARTMENT OF ADMINISTRATION
STATE OF MONTANA

_____
RUSS KATHERMAN
Administrator, Architecture & Engineering Division
for the DIRECTOR, DEPARTMENT OF ADMINISTRATION

_____
Date

Clear Form

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT
59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

PERFORMANCE BOND # _____

KNOW ALL PERSONS BY THESE PRESENTS, that we:

_____

(Contractor), hereinafter called the Principal, and

_____

(Surety), a corporation licensed to do business as a surety under the laws of the State of Montana, hereinafter called Surety, are held and firmly bound unto the State of Montana in the full and just sum of:

AND 00/100 DOLLARS

to be paid to the State of Montana or its assigns, to which payment we bind ourselves, heirs, executors, administrators, successors and assigns, jointly, severally, firmly by this bond.

WHEREAS, the Principal has entered into a contract with the State of Montana, acting by and through its Director, Department of Administration dated _____ and whereas it is one of the conditions of the award of the contract pursuant to statutes that this bond be executed for the Project entitled:

[AGENCY NAME]
[A/E PROJECT #]

NOW, THEREFORE, the conditions of this obligation are such that if the above Principal as Contractor shall promptly and faithfully perform all of the provisions of the contract, and all obligations thereunder including the specifications, and any alterations provided for, and shall in a manner satisfactory to the State of Montana, complete the work contracted for including any alterations, and shall save harmless the State of Montana from any expense incurred through the failure of the Contractor to complete the work as specified, then this obligation shall be void; otherwise it shall remain in full force and effect.

The surety hereby waives notice of any extension of time and any alterations made in the terms of the contract, unless the cumulative cost of such alterations cause the total project cost to exceed the original contract sum by more than 10%.

FOR STATE USE ONLY:

Surety is licensed in MT: ☐ Yes ☐ No

Date Verified: _____

Verified By: _____
Architecture & Engineering Div.
Department of Administration
State of Montana

Contractor: _____
Signature

_____
Print Name

_____
Date

Surety: _____
Print Name

_____
Date

By: _____
Attorney-in-Fact, Seal & Signature

_____
Agency

_____
Street Address

_____
Mailing Address

_____ _____
Phone Fax

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT
59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

LABOR & MATERIAL PAYMENT BOND # _____

KNOW ALL PERSONS BY THESE PRESENTS, that we:

_____

(Contractor), hereinafter called the Principal, and

_____

(Surety), a corporation licensed to do business as a surety under the laws of the State of Montana, hereinafter called Surety, are held and firmly bound unto the State of Montana in the full and just sum of:

AND 00/100 DOLLARS

to be paid to the State of Montana or its assigns, to which payment we bind ourselves, heirs, executors, administrators, successors and assigns, jointly, severally, firmly by this bond.

WHEREAS, the Principal has entered into a contract with the State of Montana, acting by and through its Director, Department of Administration dated _____ and whereas it is one of the conditions of the award of the contract pursuant to statutes that this bond be executed for the Project entitled:

[PROJECT NAME]
[AGENCY NAME]
[A/E PROJECT #]

NOW, THEREFORE, the conditions of this obligation are such that if the above Principal as Contractor shall promptly and faithfully perform all of the provisions of the contract, and all obligations thereunder including the specifications, and any alterations provided for, and shall in a manner satisfactory to the State of Montana, complete the work contracted for including any alterations, and shall save harmless the State of Montana from any expense incurred through the failure of the Contractor to complete the work as specified, then this obligation shall be void; otherwise it shall remain in full force and effect.

The surety hereby waives notice of any extension of time and any alterations made in the terms of the contract, unless the cumulative cost of such alterations cause the total project cost to exceed the original contract sum by more than 10%.

FOR STATE USE ONLY:

Surety is licensed in MT: ☐ Yes ☐ No

Date Verified: _____

Verified By: _____
Architecture & Engineering Div.
Department of Administration
State of Montana

Contractor: _____
Signature

_____
Print Name

_____
Date

Surety: _____
Print Name

_____
Date

By: _____
Attorney-in-Fact, Seal & Signature

_____
Agency

_____
Street Address

_____
Mailing Address

_____ _____
Phone Fax

STATE OF MONTANA

DEPARTMENT OF ADMINISTRATION

ARCHITECTURE & ENGINEERING DIVISION

1520 EAST SIXTH AVE • PO BOX 200103 • HELENA MT 59620

406.444.3104 • DOAAEDivision@mt.gov • architecture.mt.gov

FORM 100

SCHEDULE OF AMOUNTS FOR CONTRACT PAYMENT

Project: _____ AE# _____

Location: _____ Date: _____

Contractor: _____

Address: _____

DIV NO	DESCRIPTION	LABOR COSTS	MATERIAL COSTS	OTHER COSTS	TOTAL ITEM COST
	TOTAL PROJECT COST				

This Schedule of Values is a statement made by the Contractor to the Architect/Engineer and Owner that allocates the contract sum among the various portions of the Work and shall form the basis for review of the Contractor's Payment Requests.

Submitted By: _____ _____ Date: _____

Company/Contractor Signature

Reviewed By: _____ _____ Date: _____

Architect/Engineer Signature

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT 59620-0103
Phone: 406 444-3104 • Fax: 406 444-3399

A/E #:
Date:
Pay Estimate #:
Period From:
To:

PERIODIC ESTIMATE FOR PARTIAL PAYMENT

Project Name:
Location:
Contractor:
Address:
Phone/Fax:
E-mail:
Fax:

RETAINAGE ADJUSTMENT	
1. Total Retainage to Date:	0.00
2. Less Securities Deposited or Retainage Paid Out:	
3. Retainage Withheld (1 - 2)	0.00

CONTRACT AMOUNT STATUS		
1. Original Contract Amount:		
2. Net +/- by Change Order	(Pulls from Change Order Summary)	0.00
3. Contract Amount to Date:		0.00

CHANGE ORDER SUMMARY			
No.	Date Approved	Additions	Deductions
	TOTALS:	0.00	0.00
		NET TOTAL:	0.00

CONTRACT STATUS			
1. Work in Place (from next page):	(Col D + E Total - Grand Totals Page 2)		0.00
2. Total Work & Stored Material:	(Col G Total -Grand Totals Page 2)		0.00
3. Retainage Withheld		5%	0.00
4. Total Earned Less Retainage:			0.00
5. Less Pervious Payments:	(Col D - Prior Ret. Total in Grand Totals Page 2)		0.00
6. Amount Due This Payment:			0.00
7. Less 1% State Contractor's Tax:	(Contracts >4999.99)		0.00
8. Payment Due Contractor:			0.00

I hereby certify that this submitted request for payment is correct, thru and just in all respects and that payment or credit has not previously been received. I future warrant and certify by submission of this request that all previous work for which payment has been received is free and clear of all liens, disputes, claims, security interest, encumbrances, or causes of action of any type or kink in favor of the contractor, subcontractors, material suppliers, or other persons or entities and do hereby release the owner from such.

Submitted by: _____ (Company/Contractor) _____ (Name) Date: _____

Reviewed by: _____ (Architect/Engineer) _____ (Name) Date: _____

Approved by: **Montana Dept of Administration**
Architecture and Engineering Division _____ (Name) Date: _____

FOR OWNER'S USE: Davis-Bacon certified payroll on file (for federally funded projects only where D-B applies)? Initials of PM/CM: _____ Date: _____

WORK IN PLACE / STORED MATERIALS

Project Name: _____ Contractor: _____ A/E No.: _____

Location: _____ Date: _____

Pay Estimate No: _____

	A	B	C	D	E	F	G	H	I	J
ITEM NO.	CONTRACTOR ITEM NO	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIAL PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G/C)	BALANCE TO FINISH (C-G)	RETAINAGE
1							0.00		0.00	0.00
2							0.00		0.00	0.00
3							0.00		0.00	0.00
4							0.00		0.00	0.00
5							0.00		0.00	0.00
6							0.00		0.00	0.00
7							0.00		0.00	0.00
8							0.00		0.00	0.00
9							0.00		0.00	0.00
10							0.00		0.00	0.00
11							0.00		0.00	0.00
12							0.00		0.00	0.00
13							0.00		0.00	0.00
14							0.00		0.00	0.00
15							0.00		0.00	0.00
16							0.00		0.00	0.00
17							0.00		0.00	0.00
18							0.00		0.00	0.00
19							0.00		0.00	0.00
20							0.00		0.00	0.00
21							0.00		0.00	0.00
22							0.00		0.00	0.00
23							0.00		0.00	0.00
24							0.00		0.00	0.00
25							0.00		0.00	0.00
26							0.00		0.00	0.00
27							0.00		0.00	0.00
		PAGE TOTALS:	0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		ADDITIONAL PAGE TOTALS:	0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		GRAND TOTALS:	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00%***	***0.00***	***0.00***

Attach additional sheets as needed.

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT 59620-0103
Phone: 406 444-3104 • Fax: 406 444-3399

ACKNOWLEDGEMENT OF SUBCONTRACTORS

Project Name: _____ A/E #: _____
Location: _____ Date: _____

Contractor: _____
Address: _____

TO: DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 EAST SIXTH AVENUE, P.O. BOX 200103
HELENA MT 59620-0103

Listed below are the principal subcontractors proposed on this project. *All subcontracts exceeding $5,000 are to be listed.* The Contractor certifies that these subcontractors:

1. Have been advised of the labor standards and provisions applicable to this project.
2. That all provisions incorporated in the Contract between the Owner and the undersigned contractor will be incorporated in the contracts between the Contractor and any Subcontractors.
3. Are competent to accomplish the work subcontracted to them.

NAME AND ADDRESS OF SUBCONTRACTORS	REGISTRATION NO.	TYPE OF WORK

NAME AND ADDRESS OF SUBCONTRACTORS	REGISTRATION NO.	TYPE OF WORK

Submitted By: _____ _____ _____

Company/Contractor | Signature | Date

Reviewed By: _____ _____ _____

Architect/Engineer | Signature | Date

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT
59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

CONSENT OF SURETY COMPANY TO FINAL PAYMENT

Project: _____
Location: _____
A/E#: _____

TO: **DEPARTMENT OF ADMINISTRATION**
ARCHITECTURE AND ENGINEERING DIVISION
1520 EAST SIXTH AVENUE, P.O. BOX 200103
HELENA MT 59620-0103

Contractor: _____ Contract Date: _____

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the (Insert name and address of Surety Company)

,Surety Company,

on bond of (Insert name and address of Contractor)

,Contractor,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of its obligations to the Montana Department of Administration, Owner, as set forth in the said Surety Company's bond. The Surety agrees to be bound to the warranty period under the same conditions as the Contractor. The warranty is defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project unless otherwise modified in writing as part of the Substantial Completion or Final Acceptance.

IN WITNESS WHEREOF,
the Surety Company has hereunto set its hand this _____ Day of _____, _____

_____
Surety Company

_____
Signature of Authorized Representative

_____
Title

Attest:
(Seal)

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
1520 East Sixth Avenue • P.O. Box 200103 • Helena MT
59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

CONTRACT CHANGE ORDER

Project Name: _____ A/E #: _____
Location: _____ Chg. Order #: _____
Contractor: _____ Date: _____
Address: _____ Phone: _____

The Contractor is hereby directed to make the following changes in the Contract:

ITEM NO.	DESCRIPTION/UNIT BREAKDOWN/UNIT COSTS (Indicate Critical Path Schedule impact for each Item)	COST (Indicate + or -)
	TOTAL FROM PAGE 2	$ 0.00
	SUBTOTAL (Labor & Materials) =	$ 0.00
O&P Included above: ◉	Calculate O&P ○ Overhead & Profit @ 15 % =	$ 0.00
	TOTAL COST (This Change Order Only) =	$ 0.00

Change In Contract Duration/Time By This Change Order:

No Change ○ Increase ○ Decrease ○ BY_____CALENDAR DAYS.

NEW CONTRACT COMPLETION DATE:

CONTRACT STATUS	
1. Original Contract Amount	
2. Net Change by Previous Change Order(s)	
3. Current Contract Amount (1+2)	$ 0.00
4. This Change Order Total Amount	$ 0.00
5. New Contract Amount (3+4)	$ 0.00
6. Total Cost of All Change Orders to Date (2+4)	$ 0.00

A/E #: _____
Change Order #: _____

ITEM NO.	DESCRIPTION/UNIT BREAKDOWN/UNIT COSTS (Indicate Critical Path Schedule impact for each Item)	COST (Indicate + or -)
	SUBTOTAL (Labor & Materials) this page only. Carry forward to first page. =	$ 0.00

A/E #: _____
Change Order #: _____

JUSTIFICATION FOR CHANGE(S) (To be completed by Architect/Engineer):
Describe the details which mandate the change(s).

JUSTIFICATION FOR COST ADJUSTMENT (To be completed by Architect/Engineer):
Describe the basis used to calculate the cost adjustment.

JUSTIFICATION FOR SCHEDULE ADJUSTMENT (To be completed by Architect/Engineer):
Describe the impact of adjustment(s) to the critical path.

APPROVALS

By signature on this change order, the Contractor certifies that this change order is complete and includes all direct costs, indirect costs and consequential items (including additional time, if any) and is free and clear of any and all claims or disputes (including, but not limited to, additional costs, additional time, disruptions, and impacts) in favor of the Contractor, subcontractors, material suppliers, or other persons or entities concerning this change order and on all previously contracted Work and does hereby release the Owner from such.

Approved by Contractor: _____ By: _____ Date: _____

Recommended by Architect/Engineer: _____ By: _____ Date: _____

Reviewed by Agency: _____ By: _____ Date: _____

Surety Consent: SURETY CONSENT IS REQUIRED IF THE TOTAL AMOUNT OF ALL CHANGE ORDERS (LINE 6) EXCEEDS 10% OF THE ORIGINAL CONTRACT AMOUNT.

The Surety consents to this Contract Change Order and agrees that its bond or bonds shall apply and extend to the Contract as modified or amended per this Change Order. The principal and the Surety further agree that on or after execution of this consent, the penalty of the applicable Performance Bond and Labor & Material Bond is increased by:

_____ (____)
By One Hundred Percent (100%) of ALL Change Orders

Countersigned by Resident Agent: _____ Date: _____

Surety: _____

_____

_____

Recommended by: A&E Project Manager: _____ Date: _____

Accepted by: Montana Dept. of Administration: _____ Date: _____
Architecture & Engineering Division

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
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CONTRACTOR'S AFFIDAVIT OF COMPLETION, PAYMENT OF DEBTS AND CLAIMS, AND RELEASE OF LIENS

Project Name: _____

Location: _____

A/E #: _____

I CERTIFY to the best of my knowledge and belief that all work has been performed and materials supplied in strict accordance with the terms and conditions of the corresponding contract documents between the STATE OF MONTANA, acting by and through its DIRECTOR, DEPARTMENT OF ADMINISTRATION, hereinafter called the Owner, and

_____

, hereinafter called the CONTRACTOR, for the above referenced project.

I further certify and declare that all bills for materials, supplies, utilities and for all other things furnished or caused to be furnished by the CONTRACTOR and used in the execution of the contract will be fully paid upon receipt of Final Payment and that there are no unpaid obligations, liens, claims, security interests, encumbrances, liabilities and/or demands of State Agencies, subcontractors, materialmen, mechanics, laborers or any others resulting from or arising out of any work done, caused to be done or ordered to be done by the CONTRACTOR under the contract.

In consideration of the prior and final payments made and all payments made for authorized changes, the CONTRACTOR releases and forever discharges the OWNER from any and all obligations, liens, claims, security interests, encumbrances and/or liabilities arising by virtue of the contract and authorized changes between the parties, either verbal or in writing, and any and all claims and demands of every kind and character whatsoever against the OWNER, arising out of or in any way relating to the contract and authorized changes.

I further certify and agree that the warranty period is defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project unless otherwise modified in writing as part of the Substantial Completion or Final Acceptance.

This statement is made for the purpose of inducing the OWNER to make FINAL PAYMENT under the terms of the contract, relying on the truth and statements contained herein.

(Seal) CONTRACTOR

_____ _____
(Signature) (Title)

Subscribed and sworn to me this _____ Day of _____ , _____

(Seal) NOTARY

Notary Public for the State of Montana
My Commission Expires:

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
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59620-0103 Phone: 406 444-3104 • Fax: 406 444-3399

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project Name: _____ A&E #: _____
Project Address: _____ Date: _____
Project Location: _____

Agency: _____
Address: _____
Contact Name: _____
Contact #: _____

To: **MONTANA DEPARTMENT OF ADMINISTRATION**
ARCHITECTURE AND ENGINEERING DIVISION
1520 E. SIXTH AVENUE, P.O. BOX 200103
HELENA MT 59620-0103

Architect/Engineer: _____

Contractor: _____ Contract Date: _____
Contract Award Amount: _____

PROJECT OR DESIGNATED PORTION SHALL INCLUDE:

The work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below is hereby established as: _____

BASIC PROJECT INFORMATION (required by Risk & Tort Defense Division)	NEW		REMODEL/RENOVATION	
Total Square Footage		Sq. Ft.		Sq. Ft.
General Construction Material (e.g. masonry, metal panel, wood, etc.)				
Total Construction Cost				
Fire Sprinklers Installed (yes/no)	Yes	No	Yes	No
Estimated Date of Occupancy (if different from date of Substantial)				
Building Usage:				
Safety Consultation with DLI:	Yes	No	Yes	No
Additional Comments:				

Definition of Date of Substantial Completion
The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect/Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

A list of items to be completed or corrected, prepared by the Contractor and verified and amended by the Architect/Engineer, is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents. The warranty period is defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project unless otherwise modified in writing as part of the Substantial Completion or Final Acceptance.

Architect/Engineer	Signature	Date

The Contractor will complete or correct the Work on the list of items attached hereto within _____ days from the above Date of Substantial Completion.

Contractor	Signature	Date

The Owner accepts the Work or designated portion thereof as substantially complete and will assume full possession thereof at _____ (Time) on _____ (Date)

State of Montana Department of Administration,
Architecture and Engineering Division

Owner	Signature	Date

The responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance will be as follows (use attachments as necessary):

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
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CONSTRUCTION CHANGE DIRECTIVE

Project Name: _____ A/E #: _____
Location: _____ Date: _____
Contractor: _____ Change Directive #: CCD-_____
_____
_____

Owner: **MONTANA DEPARTMENT OF ADMINISTRATION**
ARCHITECTURE AND ENGINEERING DIVISION
1520 EAST SIXTH AVENUE, P. O. BOX 200103
HELENA MT 59620

Architect/Engineer: _____
_____
_____

The Contractor is directed to proceed as described below. Proceed with this Work promptly. Costs for the Work (if any) involved and change in Contract Time (if any) will be included in a subsequent Change Order.
Description:

Attachments: (insert listing of documents that support description)

The following is based on information provided by the Contractor:

☐ Lump Sum
☐ Unit Price
☐ Estimated Not To Exceed

} Change in Contract Sum of _____

☐ Fixed
☐ Estimated
☐ Maximum

} Change in Contract Time of _____ Calendar Days.

Issued By: _____ _____ _____
Architect / Engineer — Signature — Date

Accepted By: _____ _____ _____
Company / Contractor — Signature — Date

Accepted By: MT Dept. of Administration, A&E Division _____ _____
Signature — Date

STATE OF MONTANA

DEPARTMENT OF ADMINISTRATION

ARCHITECTURE AND ENGINEERING DIVISION

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REQUEST FOR INFORMATION

Project Name: _____ A/E #: _____

Location: _____ RFI #: _____

Date: _____

To: _____ Attention: _____

_____

_____

From: _____ Attention: _____

_____

_____

Trades Affected: _____

In order to expedite the Work and avoid or minimize delays in the Work the following information is requested. Please return a response by:

Date Sent: _____

Date Received: _____

Information Requested:

Response:

Response Date: _____ Respondent: _____

This RFI is for clarification only. The contractor shall notify the Owner's Representative within 48 hours if he/she feels the response to this RFI constitutes additional work.

Distribution:

- ☐ Owner
- ☐ Agency
- ☐ Architect
- ☐ Contractor
- ☐ Engineer
- ☐ Other _____

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CERTIFICATE OF FINAL ACCEPTANCE

Project Name: _____ A&E #: _____
Location: _____ Date: _____

To: **MONTANA DEPARTMENT OF ADMINISTRATION**
ARCHITECTURE AND ENGINEERING DIVISION
1520 E. SIXTH AVENUE, P.O. BOX 200103
HELENA MT 59620-0103

Architect/Engineer: _____
_____
_____

Contractor: _____ Contract Date: _____
_____ Contract Amount: _____
_____

The Work performed under this Contract has been reviewed and found to be complete and has reached Final Acceptance. The Date of Final Acceptance of the Work is defined as the Date Certified by the Architect/Engineer upon which the Work is fully complete in all aspects, **and** which the Owner accepts the Contractor's work as complete. The Date of Final Acceptance of the Project, or portion thereof designated above, is also the basis for commencement of the DURATION of applicable warranties required by the Contract Documents. The Warranty Period is defined in the Contract Documents as commencing with Substantial Completion(s) and continuing for one (1) calendar year from the Date of Final Acceptance. This date shall correspond to the date of the Architect/ Engineer's approval on the final pay application unless otherwise agreed upon in writing. In the event of a disparity between the date of the Architect/Engineer's approval and this form, if no other written agreement exists as to the date of final acceptance, this form shall constitute such agreement and it shall govern as the date of Final Acceptance.

Date of Substantial Completion:	Date of Final Acceptance:	Date of Warranty Expiration:

Notes:

Architect / Engineer	Signature	Date
Contractor	Signature	Date
State of Montana Department of Administration, Architecture and Engineering Division Owner	Signature	Date

Clear Form

STATE OF MONTANA
DEPARTMENT OF ADMINISTRATION
ARCHITECTURE AND ENGINEERING DIVISION
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Buy-Safe Montana

_____ submits the following Buy-Safe Montana values for A&E review. For assistance, clarification, or the latest industry average rates, visit: https://www.bls.gov/iif/osheval.htm

Incident Rate: _____

Industry Average Incident Rate: _____

Experience Modification Ratio (EMR): _____

Loss Ratio: _____

Less than Industry Average Incident Rate -	☐ Yes	☐ No
EMR less than 1.0 -	☐ Yes	☐ No
Loss ratio less than 100% -	☐ Yes	☐ No
Is a Comprehensive Safety Consultation Required? *If all 3 options are responded to as "No," a consultation is required	☐ Yes	☐ No

Explanation of above average incident rate, EMR greater than 1.0, or loss ratio greater than 100%...

Per 3.1.7 – Buy-Safe Montana. The Owner shall review the Buy-Safe Montana form provided by the Bidder under Articles 16 of the Instructions to Bidders. To promote a safe work environment, the Owner encourages an incidence rate less than the latest average for non-residential building construction for Montana as established by the federal Bureau of Labor Statistics for the prior year; an experience modification rating (EMR) less than 1.0; and a loss ratio of less than 100%. The Contractor with a greater-than-average incidence rate, an EMR greater than 1.0, and a loss ratio of more than 100% shall schedule and obtain a Comprehensive Safety Consultation from the Montana Department of Labor & Industry, Employment Relations Division, Safety Bureau before the Owner grants Substantial Completion of the Work. For assistance in obtaining the Comprehensive Safety Consultation, visit http://erd.dli.mt.gov/safety-health/onsite-consultation.

_____ Name

_____ Signature

_____ Date

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - FEDERAL

(Form Revision Date: November 2023)

ARTICLE 1 – GENERAL PROVISIONS

1.1. BASIC DEFINITIONS

1.1.1. CONTRACT DOCUMENTS. The Contract Documents consist of the Contract between Owner and Contractor (hereinafter the "Contract"), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Contract and Modifications issued after execution of the Contract. A Modification is: (1) a written amendment to the Contract signed by both parties; (2) a Change Order; (3) a Construction Change Directive; or, (4) a written order for a minor change in the Work issued by the Architect/Engineer. The Contract Documents shall include the bidding documents and any alterations made thereto by addenda. In the event of a conflict, discrepancy, contradiction, or inconsistency within the Contract Documents and for the resolution of same, the following order of hierarchy and control shall apply and prevail:

1) Contract; 2) Addenda; 3) Supplementary General Conditions; 4) General Conditions; 5) Specifications; 6) Drawings; 7) Instructions To Bidders; 8) Invitation To Bid; 9) Sample Forms.

1.1.1.1. If a conflict, discrepancy, contradiction, or inconsistency occurs within or between the Specifications and the Drawings, resolution shall be controlled by the following:

1.1.1.1.1. As between figures, dimensions, or numbers given on drawings and any scaled measurements, the figures, dimensions, or numbers shall govern;
1.1.1.1.2. As between large scale drawings and small scale drawings, the larger scale drawings shall govern;
1.1.1.1.3. As between the technical specifications and drawings; the technical specifications shall govern.
1.1.1.1.4. Shop Drawings and Submittals: Shop drawings and other submittals from the Contractor, subcontractors, or suppliers do not constitute a part of the Contract Documents.

1.1.1.2. The Contractor acknowledges, understands and agrees that the Contract Documents cannot be changed except as provided herein by the terms of the Contract. No act(s), action(s), omission(s), or course of dealing(s) by the Owner or Architect/Engineer with the Contractor shall alter the requirements of the Contract Documents and that alteration can be accomplished only through a written Modification process defined herein.

1.1.2. THE DRAWINGS. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, intent, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.3. THE SPECIFICATIONS. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

1.1.4. THE CONTRACT. The entire Contract for Construction is formed by the Contract Documents. The Contract represents the entire, complete, and integrated agreement between the Owner and Contract

hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between: (1) the Architect/Engineer and Contractor; (2) the Owner and any Subcontractor, Sub-subcontractor, or Supplier; (3) the Owner and Architect/Engineer; or, (4) between any persons or entities other than the Owner and Contractor. However, the Architect/Engineer shall at all times be permitted and entitled to performance and enforcement of its obligations under the Contract intended to facilitate performance of the Architect/Engineer's duties.

1.1.5. THE WORK. The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to completely fulfill the Contract and the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.6. THE PROJECT. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.7. TIME. Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day of a duration or time period shall be determined as the day following the current day of any event or notice starting a specified duration. All durations in the Contract Documents are calendar days unless specifically stated otherwise.

1.2. CORRELATION, INTER-RELATIONSHIP, AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1. The intent of the Contract Documents is to include all items and all effort necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and inter-related, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. It is the Contractor’s responsibility to control the Work under the Contract.

1.2.3. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3. CAPITALIZATION

1.3.1. Terms capitalized in these General Conditions include those which are: (1) specifically defined; and, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document.

1.4. INTERPRETATION

1.4.1. In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.5. EXECUTION OF THE CONTRACT AND CONTRACT DOCUMENTS

1.5.1. The Contract shall be signed by the Owner and Contractor. Execution of the Contract by the Contractor constitutes the complete and irrevocable binding of the Contractor and his Surety to the Owner for complete performance of the Work and fulfillment of all obligations. By execution of the Contract, the Contractor acknowledges that it has reviewed and familiarized itself with all aspects of the Contract Documents and agrees to be bound by the terms and conditions contained therein.

1.5.2. Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

1.5.3. The Contractor acknowledges that it has taken all reasonable actions necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to: (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, gas, electric power, phone service, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation, topography, and conditions of the ground; and, (5) the character of equipment and facilities needed for performance of the Work. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory geotechnical work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the action described and acknowledged in this paragraph will not relieve the Contractor from responsibility for properly ascertaining and estimating the difficulty and cost of successfully performing the Work or for proceeding to successfully perform the Work without additional expense to the Owner.

1.5.4. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Owner, nor does the Owner assume responsibility for any understanding reached or representation made by any of its officers, agents, or employees concerning conditions which can affect the Work unless that understanding or representation is expressly stated in the Contract Documents.

1.5.4.1. Performance of any portion of the Work beyond that required for complying with the specifications and all other requirements of the Contract, shall be deemed to be for the convenience of the Contractor and shall be at the Contractor's sole expense.

1.5.4.2. There shall be no increase in the contract price or time allowed for performance which is for the convenience of the Contractor.

1.6. OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE

1.6.1. The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect/Engineer and the Architect/Engineer's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect/Engineer or the Architect/Engineer's consultants. Unless otherwise indicated, the Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights except as defined in the Owner’s Contract with the Architect/Engineer. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect/Engineer upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer, and the Architect/Engineer's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' copyrights or other reserved rights.

1.6.2. Owner's Disclaimer of Warranty: The Owner has requested the Architect/Engineer prepare the Contract Documents for the Project which are adequate for bidding and constructing the Project. However, the Owner makes no representation, guarantee, or warranty of any nature whatsoever to the Contractor concerning such documents. The Contractor hereby acknowledges and represents that it has not, does not, and will not rely upon any such representation, guarantee, or warranty concerning the Contract Documents as no such representation, guarantee, or warranty have been or are hereby made.

ARTICLE 2 – THE OWNER

2.1. THE STATE OF MONTANA

2.1.1. The Owner is the State of Montana and is the sole entity to be identified as Owner in the Contract and as referred to throughout the Contract Documents as if singular in number.

2.1.2. Except as otherwise provided in Subparagraph 4.2.1, the Architect/Engineer does not have authority to bind the Owner. The observations and participations of the Owner or its authorized representative do not alleviate any responsibility on the part of the Contractor. The Owner reserves the right to observe the work and make comment. Any action or lack of action by the Owner shall not be construed as approval of the Contractor's performance.

2.1.3. The Owner reserves the right to require the Contractor, all sub-contractors and material suppliers to provide lien releases at any time. The Owner reserves the right to withhold progress payments until such lien releases are received for all work for which prior progress payments have been made. Upon the Owner's demand for lien releases (either verbally or written), the Contractor, all sub-contractors and material suppliers shall provide such releases with every subsequent application for payment through Final Acceptance of the Project.

2.1.4. Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2.1.5. Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.1.6. Unless otherwise provided in the Contract Documents, the Contractor will be furnished electronic copies of Drawings and Specifications as are reasonably necessary for execution of the Work.

2.2. OWNER'S RIGHT TO STOP WORK

2.2.1. If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated. However, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3. The issuance of a stop work order by the Owner shall not give rise to a claim by the Contractor or any subcontractor for additional cost, time, or other adjustment.

2.3. OWNER'S RIGHT TO CARRY OUT THE WORK

2.3.1. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be

issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and increased costs, and compensation for the Architect/Engineer's additional services made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.4. OWNER'S RIGHT TO PERSONNEL

2.4.1. The Owner reserves the right to have the Contractor and/or subcontractors remove person(s) and/or personnel from any and all work on the project with cause but without cost to the Owner. Such requests from the Owner may be made verbally or in writing and may be done directly with the Contractor or indirectly through the Architect/Engineer. Cause may be, but not limited to, any of the following: incompetence, poor workmanship, poor scheduling abilities, poor coordination, disruption to the facility or others, poor management, causes delay or delays, disruption of the Project, will not strictly adhere to facility procedures and Project requirements either knowingly or unknowingly, insubordination, drug/alcohol use, possession of contraband, belligerent acts or actions, etc. The Contractor shall provide replacement person(s) and/or personnel acceptable to the Owner at no cost to the Owner.

2.4.2. Any issue or circumstance relating to or resulting out of this clause shall not be construed or interpreted to be interference with or impacting upon the Contractor's responsibilities and liabilities under the Contract Documents.

2.4.3. Person(s) and/or personnel who do not perform in accordance with the Contract Documents, shall be deemed to have provided the Owner with cause to have such persons removed from any and all involvement in the Work.

2.4.4. The Contractor agrees to indemnify and hold harmless the Owner from any and all causes of action, demands, claims, damages, awards, attorneys' fees, and other costs brought against the Owner and/or Architect/Engineer by any and all person(s) or personnel as a result of actions under this clause.

ARTICLE 3 – THE CONTRACTOR

3.1. GENERAL

3.1.1. The Contractor is the person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.2. Construction Contractor Registration: The Contractor is required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. A bidder must demonstrate that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work. If the prevailing bidder cannot or does not register in time for the Owner to execute the Contract within fifteen (15) days of the date on the notice of award, the Owner may award, at its sole discretion, to the next lowest responsible bidder who meets this requirement. The Owner will not execute a contract for construction nor issue a Notice to Proceed to a Contractor who is not registered per 39-9-401(a) MCA. It is solely the Contractor's responsibility to ensure that all Subcontractors are registered in accordance with Title 39, Chapter 9, MCA.

3.1.3. The Owner's engagement of the Contractor is based upon the Contractor's representations by submission of a bid to the Owner that it:

3.1.3.1. has the requisite skills, judgment, capacity, expertise, and financial ability to perform the Work;

3.1.3.2. is experienced in the type of labor and services the Owner is engaging the Contractor to perform;

3.1.3.3. is authorized, licensed and registered to perform the type of labor and services for which it is being engaged in the State and locality in which the Project is located;

3.1.3.4. is qualified, willing and able to perform the labor and services for the Project in the manner and scope defined in the Contract Documents; and,

3.1.3.5. has the expertise and ability to provide labor and services that will meet the Owner's objectives, intent and requirements, and will comply with the requirements of all governmental, public, and quasi-public authorities and agencies having or asserting jurisdiction over the Project.

3.1.4. The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.5. The Contractor shall provide on minimum of a bi-weekly basis the onsite Superintendent's daily reports/logs

3.1.6. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect/Engineer in the Architect/Engineer's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.1.7. Quality Control (i.e. ensuring compliance with the Contract Documents) and Quality Assurance (i.e. confirming compliance with the Contract Documents) are the responsibility of the Contractor. Testing, observations, and/or inspections performed or provided by the Owner are solely for the Owner's own purposes and are for the benefit of the Owner. The Owner is not liable or responsible in any form or fashion to the Contractor regarding quality assurance or extent of such assurances. The Contractor shall not, under any circumstances, rely upon the Owner's testing or inspections as a substitute or in lieu of its own Quality Control or Assurance programs.

3.1.8. Buy-Safe Montana Provision: The Owner shall review the Buy-Safe Montana Form provided by the Bidder under Articles 16 of the Instructions to Bidders. To promote a safe work environment, the Owner encourages an incidence rate less than the latest average for non-residential building construction for Montana as established by the federal Bureau of Labor Statistics for the prior year; an experience modification rating (EMR) less than 1.0; and a loss ratio of less than 100%. The Contractor with a greater-than-average incidence rate, an EMR greater than 1.0, and a loss ratio of more than 100% shall schedule and obtain a Comprehensive Safety Consultation from the Montana Department of Labor & Industry, Employment Relations Division, Safety Bureau before the Owner grants Substantial Completion of the Work. For assistance in obtaining the Comprehensive Safety Consultation, visit http://erd.dli.mt.gov/safety-health/onsite-consultation.

3.2. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1. Since the Contract Documents are complementary and inter-related, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions affecting the Work. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents. However, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect/Engineer as a request for information in such form as the Architect/Engineer may require.

3.2.2. Any errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect/Engineer, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.

3.2.3. If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect/Engineer in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.4 and 4.3.5. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect/Engineer for damages resulting from errors, inconsistencies, or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents

unless the Contractor recognized such error, inconsistency, omission or difference and failed to report it to the Architect/Engineer.

3.2.4. Except as otherwise expressly provided in this Contract, the Contractor assumes all risks, liabilities, costs, and consequences of performing any effort or work in accordance with any written or oral order (including but not limited to direction, instruction, interpretation, or determination) of a person not authorized in writing by the Owner to issue such an order.

3.2.5. By entering into this Contract, the Contractor acknowledges that it has informed itself fully regarding the requirements of the Drawings and Specifications, the General Conditions, the Supplementary General Conditions, all other documents comprising a part of the Contract Documents and all applicable laws, building codes, ordinances and regulations. Contractor hereby expressly acknowledges, guarantees, and warrants to the Owner that:

3.2.5.1. the Contract Documents are sufficient in detail and scope to enable Contractor to construct the finished project;

3.2.5.2. no additional or further work should be required by Owner at the time of Owner's acceptance of the Work; and,

3.2.5.3. when the Contractor's work is finished and the Owner accepts, the Work will be complete and fit for the purpose intended by the Contract Documents. This acknowledgment and guarantee does not imply that the Contractor is assuming responsibilities of the Architect/Engineer.

3.2.6. Sufficiency of Contract Documents: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has received, carefully reviewed, and evaluated all aspects of the Contract Documents and agrees that said Documents are adequate, consistent, coordinated, and sufficient for bidding and constructing the Work requested, intended, conceived, and contemplated therein.

3.2.6.1. The Contractor further acknowledges its continuing duty to review and evaluate the Contract Documents during the performance of its services and shall immediately notify the Architect/Engineer of any problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions it discovers in the Contract Documents and the Work to be constructed; and, any variances it discovers between the Contract Documents and applicable laws, statutes, building codes, rules or regulations.

3.2.6.2. If the Contractor performs any Work which it knows or should have known due to its experience, ability, qualifications, and expertise in the construction industry, that involves problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions in the Contract Documents and the Work to be constructed and, any variances between the Contract Documents and applicable laws, statutes, building codes, rules or regulations, without prior written notification to the Architect/Engineer and without prior authorization to proceed from the Architect/Engineer, the Contractor shall be responsible for and bear the costs and delays (including costs of any delay) of performing such Work and all corrective actions as directed by the Architect/Engineer.

3.2.6.3. Any and all claims resulting from the Contractor’s failure, including those of any subcontractor or supplier, to carefully review, evaluate, and become familiar with all aspects of the Contract Documents shall be deemed void and waived by the Contractor.

3.2.7. Sufficiency of Site Conditions: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has visited, carefully reviewed, evaluated, and become familiar with all aspects of the site and local conditions at which the Project is to be constructed. The Contractor agrees that the Contract Documents are an adequate, consistent, coordinated, and sufficient representation of the site and local conditions for the Work.

3.2.7.1. The Contractor has reviewed and become familiar with all aspects with the Site Survey and Geotechnical Report for the Project and has a full understanding of the information provided therein.

3.2.7.2. If the Work involves modifications, renovations, or remodeling of an existing structure(s) or other man-made feature(s), the Contractor certifies, warrants and guarantees that it has reviewed, evaluated, and become familiar with all available as-built and record drawings, plans and specifications, and has thoroughly inspected and become familiar with the structure(s) or man-made feature(s).

3.2.7.3. Any and all claims resulting from the Contractor's failure, including those of any subcontractor or supplier, to visit, carefully review, evaluate, and become familiar with all aspects of the site, available geotechnical information, and local conditions at which the Project is to be constructed shall be deemed void and waived by the Contractor.

3.3. SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1. The Contractor shall supervise and direct the Work using the Contractor's best skill and attention recognizing that time and quality are of the essence of the Work. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. It is the responsibility of and incumbent upon the Contractor to ensure, confirm, coordinate, inspect and oversee all Work (which is inclusive of but not limited to all submittals, change orders, schedules, workmanship, and appropriate staffing with enough competent and qualified personnel) so that the Work is not impacted in terms of any delays, costs, damages, or additional time, or effort on the part Architect/Engineer or Owner. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect/Engineer and shall not proceed with that portion of the Work without further written instructions from the Architect/Engineer. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Architect/Engineer or Owner as appropriate shall be solely responsible for any resulting loss or damage. The Contractor will be required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and shall propose any alternative procedure which the Contractor will warrant and guarantee. The Contractor is required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and to propose any alternative procedure which the Contractor will warrant.

3.3.2. The Contractor shall furnish management, supervision, coordination, labor and services that: (1) expeditiously, economically, and properly completes the Work; (2) comply with all requirements of the Contract Documents; and, (3) are performed in a quality workmanlike manner and in accordance with the standards currently practiced by persons and entities performing or providing comparable management, supervision, labor and services on projects of similar size, complexity, cost, and nature to this Project. However, the standards currently practiced within the construction industry shall not relieve the Contractor of the responsibility to perform the Work to the level of quality, detail, and excellence defined and intended by the Contract Documents as interpreted by the Architect/Engineer.

3.3.3. All services and labor rendered by the Contractor, including any subcontractors or suppliers, shall be performed under the immediate supervision at the site of persons possessing expertise and the requisite knowledge in the discipline or trade of service being rendered. The Contractor shall maintain such supervision and personnel at all times that the Contractor's personnel, subcontractors, and/or suppliers are at the site. The Contractor shall never be absent from the site during performance of any portion of the Work by any entity under the supervision and direction of the Contractor. Full time attendance by the Contractor from Notice to Proceed through Final Acceptance is an explicit requirement of this Contract.

3.3.4. The Contractor shall be responsible to the Owner for acts, damages, errors, and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

3.3.5. The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.4. LABOR, WAGES, AND MATERIALS

3.4.1. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, permits, licenses, goods, products, equipment, tools, construction equipment and machinery, water, heat, all utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work in accordance with the Contract Documents, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2. The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect/Engineer and in accordance with a Change Order. This opportunity to request substitutions does not negate or waive any requirement for the Contractor to follow a pre-bidding “prior approval” requirement nor obligate the Owner to approve any substitution request.

3.4.3. The Contractor shall enforce strict discipline, appropriate behavior, and good order among the Contractor's employees, subcontractors at every tier and level, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.4.4. Prevailing Wages and Montana Residents. (IF FEDERAL DAVIS-BACON RATES ARE INCLUDED IN THE CONTRACT DOCUMENTS, THIS PARAGRAPH 3.4.4 SHALL BE VOID IN ITS ENTIRETY AND THE CONTRACTOR SHALL COMPLY THE FEDERAL REQUIREMENTS OF ARTICLE 16 WITH TWO EXCEPTIONS: 1) Paragraph 3.4.4.2 is applicable regardless of the rates used unless specifically prohibited by federal law; and, 2) if the state prevailing rates are higher than the federal, the contractor and all subcontractors shall abide by the higher rates on a per-trade basis. ALL REPORTING, DOCUMENTATION, ETC. SHALL REMAIN AS PER THE FEDERAL REQUIREMENTS IN ARTICLE 16 REGARDLESS OF THE SCHEDULED USED.)

3.4.4.1. The Contractor and all subcontractors at any level or tier of the Work shall give preference to the employment of bona fide Montana residents in the performance of the Work and shall pay the standard prevailing rate of wages, including fringe benefits for health and welfare and pension contributions and travel allowance provisions in effect and applicable to the county or locality in which the work is being performed. (18-2-403, MCA)

3.4.4.2. At least 50% of the workers, as defined by the Department of Labor & Industry (DOLI), must be bona fide Montana residents. (18-2-401, 18-2-402, MCA)

3.4.4.3. Indian Employment Preference within the Boundaries of an Indian Reservation. All contractors that are awarded a state agency construction contract within the exterior boundaries of an Indian Reservation shall extend a hiring preference to qualified Indians as provided herein:

3.4.4.3.1. “State agency” means a department, office, board, bureau, commission, agency, or other instrumentality of the executive or judicial branches of the government of this State. “Indian” means a person who is enrolled or who is a lineal descendent of a person enrolled in an enrollment listing of the Bureau of Indian Affairs or in the enrollment listing of a recognized Indian tribe domiciled in the United States.

3.4.4.3.2. Qualified Indians – Employment Criteria: An Indian shall be qualified for employment in a permanent, temporary, or seasonal position if he or she has substantially equal qualifications for any position and resides on the reservation where the construction contract is to be performed.

3.4.4.3.3. Non-Applicability: The Indian Employment Preference Policy does not apply to a project partially funded with federal-aid money from the United States Department of Transportation or when residency preference laws are specifically prohibited by

federal law. It does not apply to independent contractors and their employees, student interns, elected officials, or appointed positions.

3.4.4.4. The Commissioner of The Montana Department of Labor and Industry (DOLI) has established the standard prevailing rate of wages in accordance with 18-2-401 and 18-2-402, MCA. A copy of the Rates entitled "State of Montana, Prevailing Wage Rates" are bound herein. The Commissioner of the Montana DOLI has established the resident requirements in accordance with 18-2-409, MCA. The Contractor and all subcontractors at any level or tier of the Work shall direct any and all questions concerning prevailing wage and Montana resident issues for all aspects of the Work to DOLI.

3.4.4.5. The Contractor and all subcontractors at any tier or level of the Work, and as determined by the Montana DOLI, shall classify all workers in the project in accordance with the State of Montana, Prevailing Wage Rates. In the event the Contractor is unable to classify a worker in accordance with these rates he shall contact DOLI for a determination of the classification and the prevailing wage rate to be paid.

3.4.4.6. The Contractor and all subcontractors at any tier or level of the Work shall be responsible for obtaining wage rates for all workers prior to their performing any work on the project. The Contractor is required to pay and insure that its subcontractors at any tier or level and others also pay the prevailing wage determined by the DOLI, insofar as required by Title 18 of the MCA and the pertinent rules and standards of DOLI.

3.4.4.7. It is not the responsibility of the Owner to determine who classifies as a subcontractor, sub-subcontractor, material man, supplier, or any other person involved in any aspect of the Work at any tier or level. All such determinations shall be the sole responsibility of the Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project at any tier or level. The Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project shall indemnify and hold harmless the Owner from all claims, attorneys' fees, damages and/or awards involving prevailing wage or Montana resident issues. Any changes to wages or penalties for failure to pay the correct wages will be the sole responsibility of the Contractor and/or his subcontractors and no further charges or claims shall be made to the Owner. If the parties mutually agree or an arbitrator or court determines that any change in wages is due and any part is attributable to the Owner, the Owner's sole liability shall be for the amount of wages ordered only and not for other expenses, charges, penalties, overhead, profit or other mark-ups.

3.4.4.8. In accordance with 18-2-422(1) MCA, each job classification's standard prevailing wage rate, including fringe benefits, that the contractors and employers shall pay during construction of the project is included herein by both reference to DOLI's "Building" or 'Heavy/Highway" schedules and as part of these Contract Documents.

3.4.4.9. The Contractor and every employer, including all subcontractors at any tier or level, is required by 18-2-422(2) MCA to maintain payroll records in a manner readily capable of being certified for submission under 18-2-423 MCA, for a period of not less than 3 years after the contractor's, subcontractor's, or employer's completion of work on the project or the Final Acceptance by the Owner, whichever is later.

3.4.4.10. Each contractor is required by 18-2-422(3) MCA to post in a visible and accessible location a statement of all wages and fringe benefits in compliance with 18-2-423.

3.4.4.11. The contractor and all subcontractors are required by MCA 18-2-417 to make wage rate adjustments for projects with a construction duration exceeding 30 months.

3.5. WARRANTY AND GUARANTEE

3.5.1. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these

requirements, including substitutions not properly approved and authorized, may be considered defective and rejected. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.5.2. The Contractor shall and does hereby warrant and guarantee all work, workmanship, and materials for the full warranty period as specified in the Contract Documents. The warranty period shall be defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project by the Owner. The date of Final Acceptance shall be the date of the Architect/Engineer's signature on the final request for payment unless otherwise agreed upon in writing for the entire project or any portion thereof, by the Owner, Architect/Engineer and Contractor.

3.5.3. In addition to the one (1) calendar year warranty and guarantee specified in this herein above, the Contractor warrants and guarantees all materials and workmanship for the roofing system for a period of two (2) calendar years from the date of Final Acceptance. This warranty shall cover all labor and materials for roof and roofing finish systems (e.g. flashing, terminations, parapet caps, etc.) repairs from moisture penetration and/or defects in workmanship.

3.5.4. Manufacturer and product warranties and guarantees, as provided by the manufacturer or as specified in the Contract Documents, are in addition to the Contractor's warranty.

3.6. TAXES

3.6.1. The Contractor is responsible for and shall pay all sales, consumer, use, and similar taxes for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.6.2. In compliance with 15-50-206 MCA, the Contractor will have 1% of his gross receipts withheld by the Owner from all payments due and sent to the Montana Department of Revenue. Each subcontractor who performs work greater than $80,000 shall have 1% of its gross receipts withheld by the Contractor and sent to the Montana Department of Revenue. The Contractor shall notify the Department of Revenue on the Department's prescribed form.

3.7. PERMITS, FEES, AND NOTICES

3.7.1. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract, including but not limited to, the building permit fee, electrical, plumbing, sewer connection fee and mechanical permit fee, and any required impact fees and which are legally required when bids are received or negotiations concluded.

3.7.2. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.

3.7.3. If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations, and does so without providing notice to the Architect/Engineer and Owner, the Contractor shall assume responsibility for such Work and shall bear the costs attributable to correction. The Contractor shall be solely responsible to insure that all work it performs is in full compliance with all prevailing and applicable codes and regulations.

3.7.4. Incident Reporting: The Contractor shall immediately notify the Owner and Architect/Engineer, both orally and in writing, of the nature and details of all incidents which may adversely affect the quality or progress of the Work, including, but not limited to, union disputes, accidents, delays, damages to Work, and other significant occurrences. Such notices are in addition to any other notices required regarding claims.

3.8. ALLOWANCES

3.8.1. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.

3.8.2. Unless otherwise provided in the Contract Documents:

3.8.2.1. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

3.8.2.2. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included by the Contractor in the Contract Sum but not in the allowances;

3.8.2.3. whenever costs are more than or less than stated allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect: (1) the difference between actual costs and the allowances under Clause 3.8.2.1; and, (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3. Materials and equipment under an allowance shall be selected by the Owner.

3.9. CONTRACTOR'S PERSONNEL

3.9.1. The Contractor shall employ competent personnel, supervisors, project managers, project engineers, project superintendent, and all others who shall be assigned to the Work throughout its duration. Contractor's personnel extend to those employed by the Contractor whether at the site or not. The Owner shall have right to review and approve or reject all replacement of Contractor's personnel. All personnel assigned by the Contractor to the Work shall possess the requisite experience, skills, abilities, knowledge, and integrity to perform the Work.

3.9.2. The superintendent and others as assigned shall be in attendance at the Project site during the performance of any and all Work. The superintendent shall represent the Contractor. All communications given to the Contractor's personnel such as the project manager or the superintendent, whether verbal, electronic or written, shall be as binding as if given to the Contractor.

3.9.3. It is the Contractor's responsibility to appropriately staff, manage, supervise and direct the Work which is inclusive of the performance, acts, and actions of his personnel and subcontractors. As such, the Contractor further agrees to indemnify and hold harmless the Owner and the Architect/Engineer, and to protect and defend both from and against all claims, attorneys' fees, demands, causes of action of any kind or character, including the cost of defense thereof, arising in favor of or against the Owner, Architect/Engineer, Contractor, their agents, employees, or any third parties on account of the performance, behavior, acts or actions of the Contractor's personnel or subcontractors.

3.9.4. Prior to the commencement of any work, the Contractor shall prepare and submit a personnel listing and organizational chart in a format acceptable to the Owner which lists by name, phone number (including cell phone), job category, and responsibility the Contractor's key/primary personnel who will work on the Project. The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference.

3.9.5. The Contractor shall immediately remove for the duration of the Project, any person making an inappropriate racial, sexual, or ethnic comment, statement, joke, or gesture toward any other individual.

3.9.6. The Contractor shall immediately remove for the duration of the Project, any person who is incompetent, careless, disruptive, or not working in harmony with others.

3.10. CONSTRUCTION SCHEDULES

3.10.1. The Contractor shall, promptly after being awarded the Contract, prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall

not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and per the requirements of the Contract Documents, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor's schedule shall be in the "Critical Path Method" and shall show the Critical Path of the Work in sufficient detail to evaluate the Contractor's progress. A request for time extension by the Contractor will not be allowed unless a change in the Work is approved by the Owner and materially affects the Critical Path. It is the Contractor's responsibility to demonstrate that any time extensions requests materially affect the Critical Path.

3.10.2. The Contractor shall prepare and keep current, for the Architect/Engineer's approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Architect/Engineer reasonable time to review submittals.

3.10.3. The Contractor shall perform the Work in accordance with the most recent schedule submitted to the Owner and Architect/Engineer.

3.10.4. The Contractor's operations (including but not limited to the Contractor's forces employed, sequences of operations, and methods of operation) at all times during the performance of the contract shall be: (a) subject to the review of the Owner or the Architect/Engineer; and, (b) sufficient to insure the completion of the Work within the specified performance period.

3.10.5. The Critical Path Method Construction Schedule prepared by the Contractor must be in a form that is acceptable to both the Architect/Engineer and the Owner.

3.10.5.1. The Schedule shall show the estimated progress of the entire Project through the individual time periods allowed for completion of each discipline, trade, phase, section, and aspect of the Work.

3.10.5.2. The Schedule shall show percent complete, progress to date, project work, and projected time to complete the work for all activities. The percent complete and minor schedule changes, including additions of activities, change orders, construction change directives, changes to sequences of activities and significant changes in activity demands must be shown by a revised Schedule. A written report providing details about the changes and what actions are anticipated to get the work completed in the contractual time period shall be submitted with the revised schedule.

3.10.5.3. The Construction Schedule shall include coordinate dates for performance of all divisions of the Work, including shipping and delivery, off-site requirements and tasks, so the Work can be completed in a timely and orderly fashion consistent with the required dates of Substantial Completion and Final Acceptance.

3.10.5.4. The Construction Schedule shall include: (i) the required commencement date, the required dates of Substantial Completion(s) and Final Acceptance for the complete Project and all phases (if any); (ii) any guideline and milestone dates required by the Owner or the Contract Documents; (iii) subcontractor and supplier schedules; (iv) a submittal schedule which allows sufficient time for review and action by the Architect/Engineer; (v) the complete sequence of all construction activities with start and completion dates; and, (vi) required decision dates.

3.10.5.5. By receiving, reviewing, and/or commenting on the Construction Schedule or any portion thereof (including logic and resource loading), neither the Owner or Architect/Engineer assume any of the Contractor's responsibility or liability that the Schedule be coordinated or complete, or for timely and orderly completion of the Work.

3.10.5.6. Receiving, reviewing, and/or commenting on the Schedule, any portion thereof, or any revision thereof, does not constitute an approval, acknowledgement, or acceptance of any duration, dates, milestones, or performance indicated therein.

3.10.5.7. A printout of the Schedule's logic showing all activities is required with the Schedule and with all updates to the Schedule.

3.10.6. The Contractor shall review and compare, at a minimum on a weekly basis, the actual status of the Work against its Construction Schedule.

3.10.7. The Contractor shall routinely, frequently, and periodically (but not less than monthly) update and/or revise its Construction Schedule to show actual progress of the Work through the date of the update or revision, projected level of completion of each remaining activity, activities modified since the previous update or revision, and major changes in scope or logic. The updated/revised Schedule shall be accompanied by a narrative report which: (1) states and explains any modifications of the critical path, if any, including any changes in logic; (2) defines problem areas and lists areas of anticipated delays; (3) explains the anticipated impact the change in the critical path or problems and delays will have on the entire Schedule and the completion of the Work; (4) provides corrective action taken or proposed; and, (5) states how problems or delays will be resolved in order to deliver the Work by the required phasing milestones (if any), Substantial Completion(s), and Final Acceptance dates.

3.10.8. Delay in Performance: If at any time the Contractor anticipates that performance of the Work will be delayed or has been delayed, the Contractor shall: (1) immediately notify the Architect/Engineer by separate and distinct correspondence of the probable cause and effect of the delay, and possible alternatives to minimize the delay; and, (2) take all corrective action reasonably necessary to deliver the Work by the required dates. Nothing in this paragraph or the Contract Documents shall be construed by the Contractor as a granting by the Architect/Engineer or Owner of constructive acceleration. The results of failure to anticipate delays, or to timely notify the Owner and Architect/Engineer of an anticipated or real delay, are entirely the responsibility of the Contractor whether compensable or not.

3.10.9. Early Completion: The Contractor may attempt to achieve Substantial Completion(s) on or before the date(s) required in the Contract. However, such early completion shall be for the Contractor's sole convenience and shall not create any real or implied additional rights to Contractor or impose any additional obligations on the Owner or Architect/Engineer. The Owner will not be liable for nor pay any additional compensation of any kind to the Contractor for achieving Substantial Completion(s) or Final Acceptance prior to the required dates as set forth in the Contract. The Owner will not be liable for nor pay any additional compensation of any kind should there by any cause whatsoever that the Contractor is not able to achieve Substantial Completion(s) earlier than the contractually required dates of Substantial Completion(s) or Final Acceptance.

3.10.10. Float in Schedule. Any and all float time in the Contractor's schedule, regardless of the path or activity, shall accrue to the benefit of the Owner and the Work, and not to the Contractor. Float also includes any difference shown between any early completion dates shown on the Contractor's Schedule for any phasing milestone(s), Substantial Completion(s) or Final Acceptance and the dates or durations as required by the Contract Documents.

Modification of Required Substantial Completion(s) or Final Acceptance Dates: Modification of the required dates shall be accomplished only by duly authorized, accepted, and approved change orders stating the new date(s) with specificity on the change order form. All rights, duties, and obligations, including but not limited to the Contractor's liability for actual, delay, and/or liquidated damages, shall be determined in relation to the date(s) as modified.

3.11. DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE

3.11.1. The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and accurately marked to record current field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect/Engineer or Owner at any time and shall be delivered to the Architect/Engineer for submittal to the Owner upon completion of the Work.

3.11.2. The Owner shall not be required to process final payment until all documentation and data required by the Contract Documents is submitted to and approved by the Architect/Engineer including, but not limited to, the As-Built Drawings. The Owner will not process any final request for payment until the Architect/Engineer has received and verified that the Contractor has performed the requirements pertaining to the as-built drawings.

3.11.3. The as-built drawings shall be neatly and clearly marked during construction to record all deviations, variations, changes, and alterations as they occur during construction along with such supplementary notes and details necessary to clearly and accurately represent the as-built condition. The as-built drawings shall be available at all times to the Owner, Architect/Engineer and Architect/Engineer's consultants.

3.12. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1. Definitions:

3.12.1.1. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.1.2. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.1.3. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.2. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect/Engineer is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

3.12.3. The Contractor shall review, approve, and submit to the Architect/Engineer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents within sixty (60) calendar days of being issued the Notice To Proceed unless noted otherwise and shall do so in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Any and all items submitted by the Contractor which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor, or in the opinion of the Architect/Engineer, have not been reviewed for compliance by the Contractor even if marked as such, may be returned by the Architect/Engineer without action and shall not result in any accusation or claim for delay or cost by the Contractor. Any submittal that, in the opinion of the Architect/Engineer, is incomplete in any area or detail may be rejected and returned to the Contractor. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all submittals are complete, accurate, and in conformance to the Contract Documents prior to submission.

3.12.4. By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents and guarantees to the Architect/Engineer and Owner that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.5. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer. Should the Contractor, Subcontractors or Sub-subcontractors install, construct, erect or perform any portion of the Work without approval of any requisite submittal, the Contractor shall bear the costs, responsibility, and delay for removal, replacement, and/or correction of any and all items, material, and /or labor.

3.12.6. The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and: (1) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work;

or, (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's approval thereof.

3.12.7. The Contractor shall direct specific attention, in writing or on re-submitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect/Engineer on previous submittals. In the absence of such written notice the Architect/Engineer's approval of a re-submission shall not apply to such revisions.

3.12.8. The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect/Engineer will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect/Engineer. The Owner and the Architect/Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect/Engineer have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this subparagraph, the Architect/Engineer will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents but shall be responsible and held liable for review and verification of all performance or design criteria as required by Paragraph 3.2.

3.12.9. Unless noted otherwise in the Contract Documents, the Contractor shall submit to the Architect/Engineer within sixty (60) days from the date of the Notice To Proceed electronic copies of all shop/setting drawings, schedules, cut sheets, products, product data, and samples required for the complete Work. Copies shall be reviewed, marked, stamped and approved on each and every copy by the Contractor prior to submission to the Architect/Engineer or they shall be returned without review or action. The Architect/Engineer shall review with reasonable promptness, making corrections, rejections, or other actions as appropriate. The Architect/Engineer’s approval or actions on shop/setting drawings, schedules, cut sheets, products, product data, or samples shall not relieve the Contractor from responsibility for, nor deviating from, the requirements of the plans and specifications. Any deviations from the plans and specifications requested or made by the Contractor shall be brought promptly to the attention of the Architect/Engineer.

3.12.10. Cost for Re-Submissions: the Contractor is responsible for ensuring that all shop drawings, product data, samples, and submittals contain all information required by the Contract Documents to allow the Architect/Engineer to take action. The costs and expenses to the Architect/Engineer for making exhaustive reviews of each Shop Drawing, Product Data item, sample, or submittal of the Contractor may be billed by the Architect/Engineer directly to the Contractor or, if otherwise agreed by the Owner in writing, may be reimbursed by the Owner to the Architect/Engineer and deducted from the Contractor’s contract via change order by the Owner. The Owner will not be liable to the Architect/Engineer for multiple reviews.

3.13. USE OF SITE

3.13.1. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.13.2. The Contractor shall not damage, endanger, compromise or destroy any part of the Project or the site, including but not limited to work performed by others, monuments, stakes, bench marks, survey points,

utilities, existing features or structures. The Contractor shall be fully and exclusively responsible for and bare all costs and delays (including and costs of delay) for any damage, endangerment, compromise, or destruction of any part of the Project or site.

3.14. CUTTING AND PATCHING

3.14.1. The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15. CLEAN UP AND SITE CONTROL

3.15.1. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract during performance of the Work and at the direction of the Owner or Architect/Engineer. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16. ACCESS TO WORK

3.16.1. The Contractor shall provide the Owner and Architect/Engineer access to the Work at all times wherever located.

3.17. ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1. The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect/Engineer harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect/Engineer. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect/Engineer.

3.18. INDEMNIFICATION

3.18.1. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph. The Contractor agrees that it will defend, protect, indemnify and save harmless the State of Montana and the Owner against and from all claims, liabilities, demands, causes of action, judgments (including costs and reasonable attorneys' fees), and losses from any cause whatever (including patent, trademark and copyright infringement) except the Owner's sole or partial negligence. This includes any suits, claims, actions, losses, costs, damages of any kind, including the State and Owner's legal expenses, arising out of, in connection with, or incidental to the Contract, but does not include any such

suits, claims, actions, losses, costs or damages which are the result of the negligent acts, actions, losses, costs, or damages which are acts, omissions or misconduct of the Owner if they do not arise out of, depend upon or relate to a negligent act, omission or misconduct of the Contractor in whole or in part.

3.18.2. In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 – ADMINISTRATION OF THE CONSTRUCTION CONTRACT

4.1. THE ARCHITECT/ENGINEER

4.1.1. The Architect/Engineer is the person lawfully licensed to practice or an entity lawfully practicing identified as such in the Agreement with the Owner and is referred to throughout the Contract Documents as if singular in number. The term “Architect/Engineer” means the Architect/Engineer’s duly authorized representative.

4.1.2. Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner.

4.1.3. If the employment of the Architect/Engineer is terminated, the Owner shall employ a new Architect/Engineer at the sole choice and discretion of the Owner, whose status under the Contract Documents shall be that of the former Architect/Engineer.

4.2. ARCHITECT/ENGINEER’S ADMINISTRATION OF THE CONSTRUCTION CONTRACT

4.2.1. The Architect/Engineer will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative throughout the complete duration of the Project, including the warranty period. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with the Architect/Engineer Contract.

4.2.2. The Architect/Engineer, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations to: (1) become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed; (2) endeavor to guard the Owner against defects and deficiencies in the Work; and, (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Owner and Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Contractor’s Work. The Owner and Architect/Engineer will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, for the safety of any person involved in the work, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

4.2.3. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

4.2.4. Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect/Engineer about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor to the Architect/Engineer. Communications by and with separate contractors shall be through the Owner to the Architect/Engineer.

4.2.5. Based on the Architect/Engineer's evaluations of the Contractor's Applications for Payment, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts. The Contractor is fully aware that the Owner (i.e. the State of Montana) has established a billing cycle for processing payments in Article 9 of these General Conditions. The Contractor and all Subcontractors are subject to all provisions of Title 28, Chapter 2, Part 21 MCA regarding all aspects of the Work.

4.2.6. The Architect/Engineer will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect/Engineer considers it necessary or advisable, the Architect/Engineer will have authority to require inspection or testing of the Work in accordance with the General Conditions and any applicable technical specification requirements, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect/Engineer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect/Engineer to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

4.2.7. The Architect/Engineer will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect/Engineer's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect/Engineer's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect/Engineer's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8. The Architect/Engineer will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9. The Architect/Engineer will conduct inspections to determine the date or dates of Substantial Completion(s) and the date of Final Acceptance, will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10. If the Owner and Architect/Engineer agree, the Architect/Engineer will provide one or more project representatives to assist in carrying out the Architect/Engineer's responsibilities. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in the Owner’s Agreement with the Architect/Engineer.

4.2.11. The Architect/Engineer will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect/Engineer's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect/Engineer shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect/Engineer to furnish such interpretations until 15 days after written request is made for them.

4.2.12. Interpretations and decisions of the Architect/Engineer will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and initial decisions, the Architect/Engineer will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will render such interpretations and decisions in good faith.

4.2.13. The Architect/Engineer's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.2.14. The Architect/Engineer's or Owner's observations or inspections do not alleviate any responsibility on the part of the Contractor. The Architect/Engineer and the Owner reserves the right to observe and inspection the work and make comment. Action or lack of action following observation or inspection is not to be construed as approval of Contractor's performance.

4.3. CLAIMS AND DISPUTES

4.3.1. Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extensions of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes, controversies, and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest solely with the party making the Claim.

4.3.1.1. Time Limits on Claims. Claims by either party must be initiated within 21 calendar days after occurrence of the event giving rise to such claim. The following shall apply to the initiation of a claim:

4.3.1.1.1. A written notice of a claim must be provided to the Architect/Engineer and the other party within 21 calendar days after the occurrence of the event or the claim is waived by the claiming party and void in its entirety.

4.3.1.1.2. Claims must be initiated by separate, clear, and distinct written notice within the 21 calendar day time frame to the Architect/Engineer and the other party and must contain the notarized statement in Sub-Paragraph 4.3.1.5 when the claim is made by the Contractor. Discussions in any form with the Architect/Engineer or Owner, whether at the site or not, do not constitute initiation of a claim. Notes in project meeting minutes, email correspondence, change order proposals, or any other form of documentation does not constitute initiation of a claim. The written notice must be a separate and distinct correspondence provided in hardcopy to both the Architect/Engineer and Owner and must delineate the specific event and outline the causes and reasons for the claim whether or not cost or time have been fully determined. Written remarks or notes of a generic nature are invalid in their entirety. Comments made at progress meetings, project site visits, inspections, emails, voice mails, and other such communications do not meet the requirement of providing notice of claim.

4.3.1.1.3. Physical Injury or Physical Damage. Should the Owner or Contractor suffer physical injury or physical damage to person or property because of any error, omission, or act of the other party or others for whose acts the other party is legally and contractually liable, claim will be made in writing to the other party within a reasonable time of the first observance of such physical injury or physical damage but in no case beyond 30 calendar days of the first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. The provisions of this paragraph shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose. In all such cases, the indemnification provisions of the Contract shall be effectual and the Contractor’s insurance shall be primary and in full effect.

4.3.1.2. All Claims must contain sufficient justification and substantiation with the written notice or they may be rejected without consideration by the Architect/Engineer or other party with no additional impact or consequence to the Contract Sum, Contract Time, or matter(s) in question in the Claim.

4.3.1.3. If additional compensation is claimed, the exact amount claimed and a breakdown of that amount into the following categories shall be provided with each and every claim:

4.3.1.3.1. Direct costs (as listed in Subparagraph 7.3.9.1 through 7.3.9.5);
4.3.1.3.2. Indirect costs (as defined in Paragraph 7.2.5); and,

4.3.1.3.3. Consequential items (i.e. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution) for the change.

4.3.1.4. If additional time is claimed the following shall be provided with each and every claim:

4.3.1.4.1. The specific number of days and specific dates for which the additional time is sought;
4.3.1.4.2. The specific reasons, causes, and/or effects whereby the Contractor believes that additional time should be granted; and,
4.3.1.4.3. The Contractor shall provide analyses, documentation, and justification of its claim for additional time in accordance with the latest Critical Path Method schedule in use at the time of event giving rise to the claim.

4.3.1.5. With each and every claim, the Contractor shall submit to the Architect/Engineer and Owner a notarized statement containing the following language:

"Under penalty of law (including perjury and/or false/fraudulent claims against the State), the undersigned,

_____, _____
(Name) (Title)

Of _____ _____
(Company) (Date)

hereby certifies, warrants, and guarantees that this claim made for Work on this Contract is a true statement of the costs, adjustments and/or time sought and is fully documented and supported under the contract between the parties.

_____, _____
(Signature) (Date)"

4.3.2. Continuing Contract Performance.

4.3.2.1. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents on the portion of the Work not involved in a Claim.

4.3.3. Claims for Cost or Time for Concealed or Unknown Conditions.

4.3.3.1. If conditions are encountered at the site which are: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents; or, (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed.

4.3.3.2. The Architect/Engineer will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the date of the Architect/Engineer's decision.

4.3.3.3. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the

Contract Sum or Contract Time, the adjustment shall be referred to the Architect/Engineer for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.3.4. Nothing in this paragraph shall relieve the Contactor of its obligation to adequately and sufficiently investigate, research, and examine the site, the site survey, topographical information, and the geotechnical information available whether included by reference or fully incorporated in the Contract Documents.

4.3.4. Claims for Additional Cost.

4.3.4.1. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.4.2. If the Contractor believes additional cost is involved for reasons including but not limited to: (1) a written interpretation from the Architect/Engineer; (2) an order by the Owner to stop the Work solely for the Owner's convenience or where the Contractor was not at least partially at fault; (3) a written order for a minor change in the Work issued by the Architect/Engineer; (4) failure of payment by the Owner per the terms of the Contract; (5) termination of the Contract by the Owner; or, (6) other reasonable grounds, Claim must be filed in accordance with this Paragraph 4.3.

4.3.5. Claims for Additional Time

4.3.5.1. If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as specified in these General Conditions shall be provided along with the notarized certification. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay for the same event or cause only one Claim is necessary. However, separate and distinct written notice is required for each separate event.

4.3.5.2. Weather Delays:

4.3.5.2.1. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction activities.

4.3.5.2.2. Inclement or adverse weather shall not be a prima facie reason for the granting of an extension of time, and the Contractor shall make every effort to continue work under prevailing conditions. The Owner may grant an extension of time if an unavoidable delay occurs as a result of inclement/severe/adverse weather and such shall then be classified as a "Delay Day". Any and all delay days granted by the Owner are and shall be non-compensable in any manner or form. The Contractor shall comply with the notice requirements concerning instances of inclement/severe/adverse weather before the Owner will consider a time extension. Each day of inclement/severe/adverse weather shall be considered a separate instance or event and as such, shall be subject to the notice requirements.

4.3.5.2.3. An "inclement", "severe", or "adverse" weather delay day is defined as a day on which the Contractor is prevented by weather or conditions caused by weather resulting immediately there from, which directly impact the current controlling critical-path operation or operations, and which prevent the Contractor from proceeding with at least 75% of the normal labor and equipment force engaged on such critical path operation or operations for at least 60% of the total daily time being currently spent on the controlling operation or operations.

4.3.5.2.4. The Contractor shall consider normal/typical/seasonal weather days and conditions caused by normal/typical/seasonal weather days for the location of the Work in the planning and scheduling of the Work to ensure completion within the Contract Time. No time extensions will be granted for the Contractor's failure to

consider and account for such weather days and conditions caused by such weather for the Contract Time in which the Work is to be accomplished.

4.3.5.2.5. A “normal”, “typical”, or “seasonal” weather day shall be defined as weather that can be reasonably anticipated to occur at the location of the Work for each particular month involved in the Contract Time. Each month involved shall not be considered individually as it relates to claims for additional time due to inclement/adverse/severe weather but shall consider the entire Contract Time as it compares to normal/typical/seasonal weather that is reasonably anticipated to occur. Normal/typical/seasonal weather days shall be based upon U.S. National Weather Service climatic data for the location of the Work or the nearest location where such data is available.

4.3.5.2.6. The Contractor is solely responsible to document, prepare and present all data and justification for claiming a weather delay day. Any and all claims for weather delay days shall be tied directly to the current critical-path operation or operations on the day of the instance or event which shall be delineated and described on the Critical-Path Schedule and shall be provided with any and all claims. The Contractor is solely responsible to indicate and document why the weather delay day(s) claimed are beyond those weather days which are reasonably anticipated to occur for the Contract Time. Incomplete or inaccurate claims, as determined by the Architect/Engineer or Owner, may be returned without consideration or comment.

4.3.5.3. Where the Contractor is prevented from completing any part of the Work with specified durations or phases due to delay beyond the control of both the Owner and the Contractor, an extension of the contract time or phase duration in an equal amount to the time lost due to such delay shall be the Contractor’s sole and exclusive remedy for such delay.

4.3.5.4. Delays attributable to and/or within the control of subcontractors and suppliers are deemed to be within the control of the Contractor.

4.3.5.5. In no event shall the Owner be liable to the Contractor, any subcontractor, any supplier, Contractor’s surety, or any other person or organization, for damages or costs arising out of or resulting from: (1) delays caused by or within the control of the Contractor which include but are not limited to labor issues or labor strikes on the Project, federal, state, or local jurisdiction enforcement actions related directly to the Contractor’s Work (e.g. safety or code violations, etc.); or, (2) delays beyond the control of both parties including but not limited to fires, floods, earthquakes, abnormal weather conditions, acts of God, nationwide material shortages, actions or inaction by utility owners, emergency declarations by federal, state, or local officials enacted in the immediate vicinity of the project, or other contractors performing work for the Owner.

4.3.6. Claims for Consequential Damages

4.3.6.1. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

4.3.6.1.1. damages incurred by the Owner for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and,

4.3.6.1.2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, income, and for loss of profit.

4.3.6.2. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this waiver of consequential damages shall be deemed to preclude an award of liquidated or actual damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4. RESOLUTION OF CLAIMS, DISPUTES, AND CONTROVERSIES

4.4.1. Decision of Architect/Engineer. Claims, including those alleging an error or omission by the Architect/Engineer, shall be referred initially to the Architect/Engineer for decision. A decision by the Architect/Engineer shall be required as a condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date of Final Acceptance, unless 30 days have passed after the Claim has been referred to the Architect/Engineer with no decision having been rendered by the Architect/Engineer. The Architect/Engineer will not decide disputes between the Contractor and persons or entities other than the Owner. Any Claim arising out of or related to the Contract, except those already waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, pending compliance with Subparagraph 4.4.5, be subject to mediation, arbitration, or the institution of legal or equitable proceedings. Claims waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4, and 9.10.5 are deemed settled, resolved, and completed.

4.4.2. The Architect/Engineer will review Claims and within ten (10) days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party; (2) reject the Claim in whole or in part; (3) approve the Claim; (4) suggest a compromise; or (5) advise the parties that the Architect/Engineer is unable to resolve the Claim if the Architect/Engineer lacks sufficient information to evaluate the merits of the Claim or if the Architect/Engineer concludes that, in the Architect/Engineer's sole discretion, it would be inappropriate for the Architect/Engineer to resolve the Claim.

4.4.3. If the Architect/Engineer requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond within ten (10) days after receipt of such request and shall either provide a response on the requested supporting data, advise the Architect/Engineer when the response or supporting data will be furnished, or advise the Architect/Engineer that no supporting data will be furnished. Upon either no response or receipt of the response or supporting data, the Architect/Engineer will either reject or approve the Claim in whole or in part.

4.4.4. The Architect/Engineer will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect/Engineer shall be final and binding on the parties but subject to mediation and arbitration.

4.4.5. When 30 days have passed upon submission of a Claim without decision or action by the Architect/Engineer, or the Architect/Engineer has rendered a decision or taken any of the actions identified in Subparagraph 4.4.2, a demand for arbitration of a Claim covered by such decision or action must be made within 30 days after the date of expiration of Subparagraph 4.4.1 or within 30 days of the Architect/Engineer’s decision or action. Failure to demand arbitration within said 30 day period shall result in the Architect/Engineer's decision becoming final and binding upon the Owner and Contractor whenever such decision is rendered.

4.4.6. If the Architect/Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7. Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect/Engineer or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect/Engineer or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8. A Claim subject to or related to liens or bonds shall be governed by applicable law regarding notices, filing deadlines, and resolution of such Claim prior to any resolution of such Claim by the Architect/Engineer, by mediation, or by arbitration, except for claims made by the Owner against the Contractor’s bonds.

4.5. MEDIATION

4.5.1. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, after initial decision by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be

subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2. The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect and/or those rules specified in the contract documents or separately agreed upon between the parties. Construction Industry Mediation Rule M-2 (filing with AAA) is void. The parties shall mutually agree upon a mediator who shall then take the place of AAA in the Construction Industry Mediation Rules. The parties must mutually agree to use AAA and no filing of a request for mediation shall be made to AAA by either party until such mutual agreement has been made. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.6. ARBITRATION

4.6.1. Any controversy or Claim arising out of or related to this Contract or the breach thereof shall be settled by arbitration in accordance with the Montana Uniform Arbitration Act (MUAA). To the extent it does not conflict with the MUAA, the Construction Industry Arbitration Rules of the American Arbitration Association shall apply except as modified herein. The parties to the arbitration shall bear their own costs and expenses for participating in the arbitration. Costs of the Arbitration panel shall be borne equally between the parties except those costs awarded by the Arbitration panel (including costs for the arbitration itself).

4.6.2. Prior to the arbitration hearing all parties to the arbitration may conduct discovery subject to the provisions of Montana Rules of Civil Procedure. The arbitration panel may award actual damages incurred if a party fails to provide full disclosure under any discovery request. If a party claims a right of information privilege protected by law, the party must submit that claim to the arbitration panel for a ruling, before failing to provide information requested under discovery or the arbitration panel may award actual damages.

4.6.3. The venue for all arbitration proceedings required by this Contract shall be the seat of the county in which the work occurs or the First Judicial District, Lewis & Clack County, as determined solely by the Owner. Arbitration shall be conducted by a panel comprised of three members with one selected by the Contractor, one selected by the Owner, and one selected by mutual agreement of the Owner and the Contractor.

4.6.4. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5, shall, after decision or action by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be subject to arbitration provided a demand for arbitration is made within the time frame provided in Subparagraph 4.4.5. If such demand is not made with the specified time frame, the Architect/Engineer's decision or action is final. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.5. Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect and/or those rules specified in the Contract Documents or separately agreed upon between the parties. Construction Industry Arbitration Rule R-3 (filing with AAA) is void. The parties shall mutually agree upon an arbitrator or arbitrators who shall then take the place of AAA in the Construction Industry Arbitration Rules. The parties must mutually agree to use AAA and no filing of a demand for arbitration shall be made to AAA by either party until such mutual agreement has been made. The demand for arbitration shall be filed in writing with the other party to the Contract and a copy shall be filed with the Architect/Engineer.

4.6.6. A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.5 and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.7. Pending final resolution of a Claim including arbitration, unless otherwise mutually agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract on Work or amounts not in dispute.

4.6.8. **Limitation on Consolidation or Joinder**. Arbitration arising out of or relating to the Contract may include by consolidation or joinder the Architect/Engineer, the Architect/Engineer's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect/Engineer, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Architect/Engineer, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Architect/Engineer, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

4.6.9. **Claims and Timely Assertion of Claims**. The party filing a demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

4.6.10. **Judgment on Final Award**. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof. The parties agree that the costs of the arbitrator(s') compensation and expenses shall be borne equally. The parties further agree that the arbitrator(s) shall have authority to award to either party some or all of the costs and expenses involved, including attorney's fees.

ARTICLE 5 – SUBCONTRACTORS

5.1. DEFINITIONS

5.1.1. A Subcontractor is a person or entity who has a direct or indirect contract at any tier or level with the Contractor or any Subcontractor to the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.2. AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1. Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract and in no instance later than (30) days after award of the Contract, shall furnish in writing to the Owner through the Architect/Engineer the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect/Engineer will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect/Engineer, after due investigation, has reasonable objection to any such proposed person or entity.

5.2.2. The Contractor shall not contract with a proposed person or entity to which the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3. If the Owner or Architect/Engineer has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect/Engineer has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement

of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4. The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect/Engineer makes reasonable objection to such substitute. The Contractor shall not change or substitute for a Subcontractor who was required to be listed on the bid without first getting the approval of the Owner.

5.2.5. Buy-Safe Montana Provision: Before commencement of each subcontractor's portion of the Work, the Contractor shall obtain each subcontractor's incidence rate, experience modification rate, and loss ratio. The Contractor shall endeavor--but is not required--to use subcontractors whose incidence rate is less than the latest average for non-residential building construction for Montana as established by the Federal Bureau of Labor Statistics for the prior year; whose experience modification rating (EMR) is less than 1.0; and whose loss ratio is less than 100%. Contractor shall require any of its subcontractors who, based on the safety information that the Contractor obtains, have greater-than-average incidence rate, an EMR greater than 1.0, and a loss ratio of more than 100%, to schedule and obtain a Comprehensive Safety Consultation from the Montana Department of Labor & Industry, Employment Relations Division, Safety Bureau before substantial completion of each such subcontractor's portion of the Work. For assistance in obtaining the Comprehensive Safety Consultation, visit http://erd.dli.mt.gov/safety-health/onsite-consultation.

5.3. SUBCONTRACTUAL RELATIONS

5.3.1. By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect/Engineer. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect/Engineer under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.3.2. Upon written request by the Owner, the Contractor shall require its subcontractors to provide to it performance and payment securities for their portion of the Work in the types and form defined in statute (18-2-201 and 18-2-203 MCA) for all sub-contractual agreements.

5.3.3. The Contractor shall prepare a Subcontractors' and Suppliers' chart in CSI division format acceptable to the Owner which lists by name, all contact information, job category, and responsibility the Contractor's Subcontractors (at all tiers or levels) and Suppliers with a pecuniary interest in the Project of greater than $5,000.00. The Contractor shall not enter into any agreement with any subcontractor or supplier to which the Owner raises a timely objection. The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference but no less than 30 days after award of the Contract.

5.3.4. All Contractors and Subcontractors to this contract must comply with all Montana Department of Labor and Industry requirements, regulations, rules, and statutes.

5.3.5. In accordance with 39-51-1104 MCA, any Contractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, who contracts with any Subcontractor who also is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, shall withhold sufficient money on the contract to guarantee that all taxes, penalties, and interest are paid upon completion of the contract.

5.3.5.1. It is the duty of any Subcontractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, to furnish the Contractor with a certification issued by the Montana Department of Labor and Industry, prior to final payment stating that said Subcontractor is current and in full compliance with the provisions of Montana Department of Labor and Industry.

5.3.5.2. Failure to comply shall render the Contractor directly liable for all taxes, penalties, and interest due from the Subcontractor, and the Montana Department of Labor and Industry has all of the remedies of collection against the Contractor under the provisions of Title 39, Chapter 51 of Montana Code Annotated, as though the services in question were performed directly for the Contractor.

5.3.6. In compliance with state statutes (15-50-206 MCA), the Contractor will have the 1% Gross Receipts Tax withheld from all payments. Each "Public Contractor" includes all Subcontractors with contracts greater than $80,000 each. The Contractor and all Subcontractors will withhold said 1% from payments made to all Subcontractors with contracts greater than $80,000.00 and make it payable to the Montana Department of Revenue. The Contractor and all Subcontractors shall also submit documentation of all contracts greater than $80,000.00 to the Montana Department of Revenue on the Department's prescribed form.

5.3.7. Construction Contractor Registration: All Subcontractors at any tier or level are required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. Subcontractors shall demonstrate to the Contractor that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work.

5.4. CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

5.4.1.1. assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and,

5.4.1.2. assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2. Upon such assignment, if the Work has been suspended for more than 30 days as a result of the Contractor's default, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Such adjustment shall be at the expense of the Contractor.

5.4.3. The Contractor shall engage each of its subcontractors and suppliers with written contracts that preserve and protect the rights of the Owner and include the acknowledgement and agreement of each subcontractor and supplier that the Owner is a third-party beneficiary of their sub-contractual and supplier agreements. The Contractor's agreements shall require that in the event of default by the Contractor or termination of the Contractor, and upon request of the Owner, the Contractor's subcontractors and suppliers will perform services for the Owner.

5.4.4. Construction Contractor Registration: All Subcontractors at any tier or level are required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. Subcontractors shall demonstrate to the Contractor that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work.

ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1. OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Paragraph 4.3.

6.1.2. When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3. The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.1.4. Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

6.2. MUTUAL RESPONSIBILITY

6.2.1. The Contractor shall afford the Owner and separate contractors reasonable opportunity' for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2. If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect/Engineer apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3. The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4. The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Paragraph 12.2.

6.2.5. The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 3.14.

6.3. OWNER'S RIGHT TO CLEAN UP

6.3.1. If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect/Engineer will determine the responsibility of those involved and allocate the cost accordingly.

ARTICLE 7 – CHANGES IN THE WORK

7.1. GENERAL

7.1.1. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, or order for a minor change in the Work subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Minor changes as ordered by the Architect/Engineer has the definition provided in Paragraph 7.4

7.1.2. A Change Order shall be based upon agreement among the Owner, Contractor, and Architect/Engineer; a Construction Change Directive requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone.

7.1.3. Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

7.1.4. No act, omission, or course of dealing, shall alter the requirement that Change Orders or Construction Change Directives shall be in writing and signed by the Owner, and that Change Orders and Construction Change Directives are the exclusive method for effecting any adjustment to the Contract. The Contractor understands and agrees that neither the Contract Sum nor the Contract Time can be changed by implication, oral agreement, verbal directive, or unsigned Change Order.

7.2. CHANGE ORDERS

7.2.1. A Change Order is a written instrument prepared by the Architect/Engineer and signed by the Owner, Contractor and Architect/Engineer, stating their agreement upon all of the following:

7.2.1.1. change in the Work;

7.2.1.2. the amount of the adjustment, if any, in the Contract Sum; and,

7.2.1.3. the extent of the adjustment, if any, in the Contract Time.

7.2.2. The cost or credit to the Owner resulting from a change in the Work shall be determined as follows:

7.2.2.1. Per the limitations of this Subparagraph, plus a 5% allowance for overhead and a 10% allowance for profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive; or,

7.2.2.2. By one of the methods in Subparagraph 7.3.4, or as determined by the Architect/Engineer per Subparagraph 7.3.9, plus a 5% allowance for overhead and a 10% allowance for profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive.

7.2.2.3. The Contractor’s proposed increase or decrease in cost shall be limited to costs listed in Subparagraph 7.3.9.1 through 7.3.9.5.

7.2.3. The Contractor shall not submit any Change Order, response to requested cost proposals, or requested changes which are incomplete and do not contain full breakdown and supporting documentation in the following three areas:

7.2.3.1. Direct costs (only those listed in Subparagraph 7.3.9.1 through 7.3.9.5 are allowable);

7.2.3.2. Indirect costs (limited as a percentage on each Change Order per Paragraph 7.2.2); and

7.2.3.3. Consequential items (e.g. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution).

7.2.4. Any Change Order, responses to requested proposals, or requested changes submitted by the Contractor which, in the opinion of the Architect/Engineer, are incomplete, may be rejected and returned to the Contractor without comment. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all Change Orders, responses to requested proposals, or requested changes are complete prior to submission.

7.2.5. Overhead, applicable to all areas and sections of the Contract Documents, means "Indirect Costs" as referenced in Subparagraph 7.2.3.2. Indirect costs are inclusive of, but not limited to, the following: home office overhead; off-site supervision; home office project management; change order and/or proposal preparation, design, research, negotiation and associated travel; effects of disruption and dilution of management and supervision off-site; time delays; coordination of trades; postage and shipping; and, effective increase in guarantee and warranty durations. Indirect costs applicable to any and all changes in the work, either through Change Order or Construction Change Directive, are limited to the percentage allowance for overhead in Subparagraph 7.2.2.

7.2.6. By signature on any Change Order, the Contractor certifies that the signed Change Order is complete and includes all direct costs, indirect costs and consequential items (including additional time, if any) and is free and clear of all claims or disputes (including, but not limited to, claims for additional costs, additional time, disruptions, and/or impacts) in favor of the Contractor, subcontractors, material suppliers, or other persons or entities concerning the signed change order and on all previously contracted Work and does release the Owner from such claims or demands.

7.2.7. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Change Order shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor's most recent Critical Path Schedule in use prior to the change. Changes which affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time, shall not result in an increase in the Contract Time.

7.2.8. Supervision means on-site, field supervision and not home office overhead, off-site management or off-site supervision.

7.2.9. Labor means those persons engaged in construction occupations as defined in Montana Prevailing Wage Rates for Building Construction or Heavy/Highway as bound in the Contract Documents and does not include design, engineering, superintendence, management, on-site field supervision, home office or other off-site management, off-site supervision, office or clerical work.

7.3. CONSTRUCTION CHANGE DIRECTIVES

7.3.1. A Construction Change Directive is a written order prepared by the Architect/Engineer directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Construction Change Directive, shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor's most recent Critical Path Schedule in use prior to the change. Changes that affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time shall not result in an increase in the Contract Time.

7.3.3. A Construction Change Directive shall be used in the absence of agreement on the terms of a Change Order.

7.3.4. If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

7.3.4.1. mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

7.3.4.2. unit prices stated in the Contract Documents or subsequently agreed upon;

7.3.4.3. cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee;

7.3.4.4. By actual cost as shown by the Contractor's and Subcontractor's itemized invoices; or

7.3.4.5. as provided in Subparagraph 7.3.9.

7.3.5. Costs shall be limited to the following: cost of materials, including cost of delivery; cost of labor, including social security, old age and unemployment insurance and fringe benefits under collective bargaining agreements; workers' compensation insurance; bond premiums; and rental value of power tools and equipment.

7.3.6. Overhead and profit allowances shall be limited on all Construction Change Directives to those identified in 7.2.2.

7.3.7. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect/Engineer of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

7.3.8. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.9. If the Contractor does not respond or disagrees with the method for adjustment in the Contract Sum in writing within seven (7) calendar days, the method and the adjustment made shall be determined by the Architect/Engineer on the basis of reasonable expenditures and/or savings of those performing the Work directly attributable to the change including, in the case of an increase in the Contract Sum, plus an allowance for overhead and profit as listed under Subparagraph 7.2.2. In such case, and also under Clause 7.3.4.3, the Contractor shall keep and present, in such form as the Architect/Engineer may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.9 shall be limited to the following:

7.3.9.1. costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance as determined by the Prevailing Wage Schedules referenced in the Contract Documents;

7.3.9.2. costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

7.3.9.3. rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

7.3.9.4. costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

7.3.9.5. additional costs of field supervision and field office personnel directly attributable to the change.

7.3.10. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect/Engineer plus markups in subparagraph 7.2.2. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net change, if any, with respect to that change.

7.3.11. Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect/Engineer will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.

7.3.12. When the Owner and Contractor agree with the determination made by the Architect/Engineer concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4. MINOR CHANGES IN THE WORK

7.4.1. The Architect/Engineer will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 – TIME

8.1. DEFINITIONS

8.1.1. Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day shall be determined as the day following the current day of any event or notice starting a specified duration.

8.1.2. Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.3. The date of commencement of the Work is the date established in the NOTICE TO PROCEED AS ISSUED BY THE OWNER.

8.1.4. The date the Contractor reaches Substantial Completion is the date certified by the Architect/Engineer in accordance with Paragraph 9.8.

8.1.5. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.1.6. Liquidated Damages. The Owner may suffer loss if the project is not substantially complete on the date set forth in the contract documents. The Contractor and his surety shall be liable for and shall pay to the Owner the sums hereinafter stipulated as liquidated damages for each calendar day of delay until the work is substantially complete: **THREE HUNDRED AND NO/100 DOLLARS ($300.00).**

8.1.7. The Contractor shall not be charged liquidated or actual damages when delay in completion of the Work is due to:

8.1.7.1. Any preference, priority or allocation order issued by the government;

8.1.7.2. Unforeseeable cause beyond the control and without the fault or negligence of the Contractor, such as acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions,

freight embargoes, and unusually severe weather. All such occurrences resulting in delay must be documented and approved by Change Order; or,

8.1.7.3. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in 8.1.7.1 and 8.1.7.2 of this article.

8.1.8. The Contractor is completely obligated and responsible to provide written notice of each day of delay as provided for in Paragraph 4.3.

8.1.9. Contract Time. All work shall reach Substantial Completion within: Start work on site **AUGUST 12, 2024** and be completed with work by **DECEMBER 10, 2024.**

8.2. PROGRESS AND COMPLETION

8.2.1. Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Contract the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the date on the Notice to Proceed and in no case prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

8.2.3. The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.2.4. If the Contractor falls behind the latest construction schedule by more than 14 calendar days through its own actions or inaction, neglect, inexperience, lack of oversight and management of the Work including that of any Subcontractors, written notice to the Owner and Architect/Engineer shall be provided within three (3) days with explanation of how the Contractor intends to get back on schedule. Response to getting back on schedule consists of providing a sufficient number of qualified workers and/or proper materials or an acceptably reorganized schedule to regain the lost time in a manner acceptable to the Owner.

8.3. DELAYS AND EXTENSIONS OF TIME

8.3.1. If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect/Engineer, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Architect/Engineer determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect/Engineer may determine.

8.3.2. Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

8.3.3. This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

PAYMENTS AND COMPLETION

9.1. CONTRACT SUM

9.1.1. The Contract Sum is stated in the Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2. SCHEDULE OF VALUES

9.2.1. Before the first Application for Payment, the Contractor shall submit to the Architect/Engineer a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to

substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3. APPLICATIONS FOR PAYMENT

9.3.1. The Contractor shall submit to the Architect/Engineer an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be signed and supported by such data substantiating the Contractor's right to payment as the Owner or Architect/Engineer may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.2. NOTICE OF APPROVAL OF PAYMENT REQUEST PROVISION. Per Title 28, Chapter 2, Part 21, this contract allows the Owner to change the number of days to approve a Contractor's payment request. This contract allows the Owner to approve the Contractor's payment request within thirty-five (35) calendar days after it is received by the Owner without being subject to the accrual of interest.

9.3.3. As provided in Subparagraph 7.3.11, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect/Engineer, but not yet included in Change Orders.

9.3.4. Applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

9.3.5. Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

9.3.6. The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.3.7. Until the work is complete, the Owner will pay 95% of the amount due the Contractor on account of progress payments.

9.3.7.1. If the Work and its progress are not in accordance with all or any part, piece, or portion of the Contract Documents, the Owner may, at its sole discretion and without claim by the Contractor, increase the amount held as retainage to whatever level deemed necessary to effectuate performance and progress of the Work, for anticipated repairs, warranties or completion of the Work by the Contractor or through the letting of other contracts. The Contractor will not be entitled to additional costs, expenses, fees, time, and such like, in the event the Owner increases the amount held as retainage due to non-compliance and/or non-performance with all or any part, piece, or portion of the Contract Documents.

9.3.7.2. Prior to the first application for payment, the Contractor shall submit the following information on the appropriate forms:

9.3.7.2.1. Schedule of Amounts for Contract Payment (Form 100): This form shall contain a breakdown of the labor, material and other costs associated with the various portions of the work and shall be the basis for the progress payments to the Contractor. The use of electronic method shall be in the Owner's format.

9.3.7.2.2. Project/Progress Schedule: If no Schedule (or revised Schedule) is provided with each and every Periodic Estimates for Partial Payment, the Architect/Engineer and/or Owner may return the pay request, or hold it, and may choose not pay for any portion of the Work until the appropriate Schedule, indicating all changes, revisions and updates, is provided. No claim for additional costs or interests will be made by the Contractor or any subcontractor on account of holding or non-payment of the Periodic Estimate for Partial Payment request.

9.3.7.3. Progress Payments

9.3.7.3.1. Periodic Estimates for Partial Payment shall be on a form provided by the Owner (Form 101) and submitted to the Architect/Engineer for payment by the Owner. Payment shall be requested for the labor and material incorporated in the work to date and for materials suitably stored, less the aggregate of previous payments, the retainage, and the 1% gross receipts tax.

9.3.7.3.2. The Contractor, by submission of any partial pay request, certifies that every request for partial payment is correct, true and just in all respects and that payment or credit had not previously been received. The Contractor further warrants and certifies, by submission of any partial pay request, that all previous work for which payment has been received is free and clear of all liens, disputes, claims, security interests, encumbrances, or causes of action of any type or kind in favor of the Contractor, subcontractors, material suppliers or other persons or entities and does release the Owner from such.

9.3.7.3.3. Progress payments do not constitute official acceptance of any portion of the work or materials whether stored on or off-site.

9.3.7.3.4. In compliance with 15-50-206 MCA, the Contractor will have 1% of his gross receipts withheld by the Owner from all payments due. Each subcontractor who performs work greater than $80,000 shall have 1% of its gross receipts withheld by the Contractor. The Contractor shall notify the Department of Revenue on the department's prescribed forms.

9.3.7.4. The Contractor may submit obligations/securities in a form specified in 18-1-301 Montana Code Annotated (MCA) to be held by a Financial Institution in lieu of retainage by the Owner. The Owner will establish the amount that would otherwise be held as retainage. Should the Contractor choose to submit obligations/securities in lieu of retainage, the Owner will require the Financial Institution to execute the Owner's "Account Agreement for Deposit of Obligations Other Than Retainage" (Form 120) prior to submission of any obligations/securities in accordance with 18-1-302 MCA. The Contractor must extend the opportunity to participate in all obligations/securities in lieu of retainage on a pro rata basis to all subcontractors involved in the project and shall be solely responsible for the management and administration of same. The Owner assumes no liability or responsibility from or to the Contractor or Subcontractors regarding the latter's participation.

9.3.7.5. The Contractor shall maintain a monthly billing cycle.

9.4. CERTIFICATES FOR PAYMENT

9.4.1. The Architect/Engineer will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect/Engineer determines is properly due, or notify the Contractor and Owner in writing of the Architect/Engineer's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1. For the purposes of this paragraph regarding certification of payment, electronic mail and/or notes provided through the use of an electronic approval system shall constitute written notice.

9.4.2. The issuance of a Certificate for Payment will constitute a representation by the Architect/Engineer to the Owner, based on the Architect/Engineer's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect/Engineer's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests

and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect/Engineer. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect/Engineer has: (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences or procedures; (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or, (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5. DECISIONS TO WITHHOLD CERTIFICATION

9.5.1. The Architect/Engineer may withhold or reject a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect/Engineer's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect/Engineer is unable to certify payment in the amount of the Application, the Architect/Engineer will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect/Engineer cannot agree on a revised amount, the Architect/Engineer will promptly issue a Certificate for Payment for the amount for which the Architect/Engineer is able to make such representations to the Owner. The Architect/Engineer may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect/Engineer's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.4, because of:

9.5.1.1. defective Work not remedied;

9.5.1.2. third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

9.5.1.3. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

9.5.1.4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

9.5.1.5. damage to the Owner or another contractor;

9.5.1.6. reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or,

9.5.1.7. persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2. When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.5.3. Owner’s Right to Refuse Payment: The Architect/Engineer’s approval, or partial approval, of the Contractor’s request for payment shall not preclude or prevent the Owner from exercising any of its remedies under this Contract. The Owner shall have right to refuse to make payment(s) to the Contractor due to:

9.5.3.1. the Contractor’s failure to perform the Work in compliance with the Contract Documents;

9.5.3.2. the Contractor’s failure to correct any defective or damaged Work;

9.5.3.3. the Contractor’s failure to accurately represent the Work performed in the pay request;

9.5.3.4. the Contractor’s performance of its Work at a rate or in a manner that, in the Owner’s opinion, is likely to result in the Work, or any portion thereof, to be delayed;

9.5.3.5. the Contractor's failure to use funds previously paid to it by the Owner to pay for the Contractor's Work-related obligations including, but not limited to, subcontractors and suppliers on this Project;

9.5.3.6. claims made, or anticipated by the Owner to be made, against the Owner or its property;

9.5.3.7. inclusion in the pay request of any amounts in dispute or part of a claim;

9.5.3.8. Damage or loss caused by the Contractor, including its subcontractors and suppliers; or,

9.5.3.9. The Contractor's failure or refusal to perform its obligations to the Owner.

9.6. PROGRESS PAYMENTS

9.6.1. After the Architect/Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents or the Owner may take any action the Owner deems necessary under Subparagraph 9.5.3.

9.6.2. The Contractor shall promptly pay each Subcontractor in accordance with Title 28, Chapter 2, Part 21, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.3. The Contractor is prohibited from holding higher amounts in retainage on any Subcontractor than the Owner is holding from the Contractor.

9.6.4. The Architect/Engineer will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect/Engineer and Owner on account of portions of the Work done by such Subcontractor.

9.6.5. Neither the Owner nor Architect/Engineer shall have an obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

9.6.6. Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3, 9.6.4, and 9.6.5.

9.6.7. A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.8. Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

9.7. FAILURE OF PAYMENT

9.7.1. If the Owner does not approve payment to the Contractor within thirty-five (35) calendar days after the receipt of a certified Application for Payment, then the Contractor may, upon seven additional days' written notice to the Owner and Architect/Engineer, suspend the Work until payment of the amount owing has been received. Nothing in the Subparagraph shall limit the Owner's rights and options as provided in Subparagraph 9.5.3. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

9.8. SUBSTANTIAL COMPLETION

9.8.1. Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

9.8.2. When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.3. Upon receipt of the Contractor's list, the Architect/Engineer will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect/Engineer's Inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect/Engineer. In such case, the Contractor shall then submit a request for another inspection by the Architect/Engineer to determine Substantial Completion.

9.8.4. The Contractor shall ensure the project is substantially complete prior to requesting any inspection by the Architect/Engineer so that no more than one (1) inspection is necessary to determine Substantial Completion for all or any portion of the Work. If the Contractor does not perform adequate inspections to develop a comprehensive list as required in Subparagraph 9.8.2 and does not complete or correct such items upon discovery or notification, the Contractor shall be responsible and pay for the costs of the Architect/Engineer’s additional inspections to determine Substantial Completion.

9.8.5. When the Work or designated portion thereof is substantially complete, the Architect/Engineer will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion and which shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. After issuance of the Certificate of Substantial Completion, the Contractor shall finish and complete all remaining items within thirty (30) calendar days of the date on the Certificate. The Architect/Engineer shall identify and fix the time for completion of specific items which may be excluded from the thirty (30) calendar day time limit. Failure to complete any items within the specified time frames may be deemed by the Owner as default of the contract on the part of the Contractor.

9.8.6. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety if there are claims or past payment issues, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.9. PARTIAL OCCUPANCY OR USE

9.9.1. The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect/Engineer as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect/Engineer.

9.9.2. Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect/Engineer shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.9.3. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10. FINAL COMPLETION AND FINAL PAYMENT

9.10.1. Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect/Engineer will promptly make such inspection and, when the Architect/Engineer finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect/Engineer will approve the Contractor's final Certificate for Payment stating that to the best of the Architect/Engineer's knowledge, information and belief, and on the basis of the Architect/Engineer's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect/Engineer's signature on the Contractor's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2. Neither final payment nor any remaining retainage shall become due until the Contractor submits to the Architect/Engineer:

9.10.2.1. completed Contractor's Affidavit of Completion, Payment of Debts and Claims, and Release of Liens (Form 106) that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied;

9.10.2.2. a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner;

9.10.2.3. a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents

9.10.2.4. Consent of Surety Company to Final Payment (Form 103); and,

9.10.2.5. if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.

9.10.3. The Contractor and his surety accepts and assumes responsibility, liability, and costs for and agrees to defend and hold harmless the Owner for and against any and all actions as a result of the Owner making final payment.

9.10.4. By submitting any Application for Payment to the Architect/Engineer the Contractor and his surety certify and declare that all bills for materials, supplies, utilities and for all other things furnished or caused to be furnished by the Contractor and all Subcontractors and used in the execution of the Contract will be fully paid upon receipt of Final Payment and that there are no unpaid obligations, liens, claims, security interests, encumbrances, liabilities and/or demands of State Agencies, subcontractors, suppliers, mechanics, laborers or any others resulting from or arising out of any work done, caused to be done or ordered to be done by the Contractor under the contract.

9.10.5. In consideration of the prior payments and the final payment made and all payments made for authorized changes, the Contractor releases and forever discharges the Owner from any and all obligations, liens, claims, security interests, encumbrances and/or liabilities arising by virtue of the contract and authorized changes between the parties, either verbal or in writing, and any and all claims and demands of every

kind and character whatsoever against the Owner, arising out of or in any way relating to the contract and authorized changes.

9.10.6. The date of Final Payment by the Owner shall constitute Final Acceptance of the Work. The determining date for the expiration of the warranty period shall be as specified in Paragraphs 3.5 and 12.2.2.

9.10.7. If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect/Engineer so confirms, the Owner shall, upon application by the Contractor and certification by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect/Engineer prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.10.8. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

9.10.8.1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

9.10.8.2. failure of the Work to comply with the requirements of the Contract Documents; or,

9.10.8.3. terms of special warranties required by the Contract Documents.

9.10.9. Acceptance of final payment by the Contractor, a Subcontractor, or material supplier, shall constitute a waiver of any and all obligations, liens, claims, security interests, encumbrances and/or liabilities against the Owner except those previously made in writing per the requirements of Paragraph 4.3 and as yet unsettled at the time of submission of the final Application for Payment.

9.10.10. The Owner's issuance of Final Payment does not constitute a waiver or release of any kind regarding any past, current, or future claim the Owner may have against the Contractor and/or the surety.

ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

10.1. SAFETY

10.1.1. **Importance of Safety**. The Contractor and all Subcontractors (at any tier or level) recognize that safety is paramount at all times. The Contractor shall perform the work in a safe manner with the highest regard for safety of its employees and all other individuals and property at the work site. Contractor shall maintain its tools, equipment, and vehicles in a safe operating condition and take all other actions necessary to provide a safe working environment for performance of work required under this Contract. The Contractor is solely responsible for the means, methods, techniques, sequences and procedures for coordinating and constructing the Work, including all site safety, safety precautions, safety programs, and safety compliance with OSHA and all other governing bodies.

10.1.2. **Particular Safeguards**. (a). The Contractor shall erect and maintain, as required by Paragraphs 10.1.1 and 10.1.3, safeguards for safety and protection, including posting danger signs and other warnings against hazards, installing suitable barriers and lighting, promulgating safety regulations, and providing notification to all parties who may be impacted by the Contractor's operations. (b) When use or storage of explosives or other Hazardous Materials/Substances (defined below) or equipment are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. (c) The Contractor shall not encumber or load or permit any part of the construction site to be encumbered or loaded so as to endanger the safety of any person(s).

10.1.3. **Compliance with Safety Laws**. Contractor represents and warrants to Owner that it knows and understands all federal, state and local safety statutes, rules, and regulations (Laws) related to the work under this Contract. Contractor shall comply with these Laws. Contractor shall keep all material data safety sheets on site and available at all times.

10.1.4. **Remedy property damage**. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor of any tier or level, or anyone employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.1.5. **Designation of Safety Representative.** Unless the Contractor designates, in writing to the Owner and the Architect/Engineer, another responsible member of the Contractor's organization as the Safety Representative, the Contractor's superintendent is the Safety Representative. The Safety Representative is defined as that member of the Contractor's organization responsible for all safety under this Contract.

10.1.6. **Release/Indemnity of Owner and Architect/Engineer**. The Contractor agrees that the Owner and Architect/Engineer are not responsible for safety at the work site and releases them from all obligations and liability regarding safety at the work site The Contractor shall indemnify and defend the Owner and the Architect/Engineer against and from all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses (including but not limited to court costs and reasonable attorney fees), arising from injuries and death to any persons and damage to real and personal property arising from, in connection with, or incidental to Contractor's safety responsibilities under this Contract.

10.2. HAZARDOUS MATERIALS/SUBSTANCES

10.2.1. "Hazardous Materials/Substances" means any substance: (a) the presence of which requires investigation, or remediation under any federal, state or local statute, rule, regulation, ordinance, order, policy or common law; (b) that is or becomes defined as "hazardous waste," "hazardous substance," pollutant, or contaminant under any federal, state or local statute, rule, regulation, or ordinance or amendments thereto; (c) that is toxic, explosive, corrosive flammable, or otherwise hazardous and is or becomes regulated by any government authority, agency, board, commission or instrumentality of the United States, the state of Montana or any political subdivision thereof; (d) gasoline, diesel fuel or other petroleum hydrocarbons; (e) containing contains polychlorinated biphenyls (PCBs) or asbestos; or (f) the presence of which causes or threatens to cause a nuisance or trespass on the work site or adjacent property.

10.2.2. The Contractor is solely responsible for all compliance with all regulations, requirements, and procedures governing Hazardous Materials/Substances at the Work Site or that Contractor brings on the site. The Contractor is solely responsible for remediation, costs, damages, loss, and/or expenses for all Hazardous Materials/Substances brought to the site. The Contractor shall not and is strictly prohibited from purchasing and/or installing any asbestos-containing materials or products as part of the Work. Should the Contractor do so, the Contractor shall be solely responsible for the immediate remediation and all costs, damages, loss, and/or expenses per Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.

10.2.3. If the Contractor encounters Hazardous Materials/Substances during the course of the Work, whether or not identified in the Contract Documents, Work, the Contractor agrees that:

10.2.3.1. Encountering any Hazardous Materials/Substances during performance of the Work does not necessarily mean a change in conditions has occurred, nor is it evidence that the Contractor is due additional Contract Time or an increase in the Contract Sum. If encountering Hazardous Materials/Substances is determined to be a change in conditions to the Contract Documents, Paragraph 4.3 and Article 7 apply in determining any additional compensation or extension of time claimed by the Contractor.

10.2.3.2. The Contractor is solely responsible for securing the Work in accordance with this Article 10 involving any Hazardous Materials/Substances against unlawful, unregulated, or improper intrusion, disturbance, or removal. The Contractor shall implement protections and take protective actions throughout the performance of the Work to prevent exposure to workers, occupants, and contamination of the site or area.

10.2.3.3. If the Contractor is unable to or fails to properly secure the Work against unlawful, unregulated, or improper intrusion, disturbance, or removal of Hazardous Materials/Substances, the Contractor shall immediately implement protections and take protective actions, up to and including stopping Work in the area or on the item affected, to prevent exposure to workers,

occupants, and contamination of the site or area. The Contractor shall immediately notify the Owner and Architect in writing giving details of the failure and the corrective actions taken. If the condition is an emergency and notice cannot be provided in writing, then Contractor shall orally and immediately notify the Owner and Architect/Engineer of the condition followed by a full written explanation. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss.

10.2.3.4. If the Contractor notifies the Owner and takes precautions in accordance with this Article 10 upon encountering materials/substances suspected of containing asbestos or polychlorinated biphenyls that are unidentified in the Contract Documents, the Owner shall verify if the unidentified material or substance contains asbestos or polychlorinated biphenyls and shall arrange for the removal or other measures as necessary to allow the Contractor to proceed with the Work. The Contract Time may be extended as appropriate if the Work affected is on the critical path and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs as provided in Article 7. Should the Contractor fail to notify the Owner upon encountering asbestos, polychlorinated biphenyls, or materials/substances suspected of containing asbestos or polychlorinated biphenyls, that are unidentified in the Contract Documents, the Contractor is solely responsible for all mitigation in accordance with Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.

10.2.4. The Contractor shall indemnify, hold harmless, and defend the Owner from and against all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses, including but not limited to court costs and reasonable attorneys' fees, arising from, in connection with, or incidental to the Contractor's handling, disposal, encountering, or release of Hazardous Materials/Substances.

10.3. UTILITIES

10.3.1. Underground Utilities: Buried utilities, including, but not limited to, electricity, gas, steam, air, water, telephone, sewer, irrigation, broadband coaxial computer cable, and fiber optic cables are very vulnerable and damage could result in loss of service. The telephone, broadband and fiber optic cables are especially sensitive and the slightest damage to these components will result in disruption of the operations of the campus.

10.3.2. "One Call" must be notified by phone and in writing at least 72 hours (3 business days) prior to digging to arrange and assist in the location of buried utilities in the field. (Dial 811). The Contractor shall mark the boundary of the work area. The boundary area shall be indicated with white paint and white flags. In winter, pink paint and flags will be accepted.

10.3.3. After buried utilities have been located, the Contractor shall be responsible for any utilities damaged while digging. Such responsibility shall include all necessary care including hand digging. Contractor's responsibility shall also include maintaining markings after initial locate. The area for such responsibility, unless otherwise indicated, shall extend 24 inches to either side of the marked center line of a buried utility line.

10.3.4. The Contractor's responsibility shall include repair or replacement of damaged utilities. The Contractor will also be responsible for all costs associated with reterminations and recertification.

10.3.5. Any buried utilities exposed by the operations of the Contractor shall be marked on the plans and adequately protected by the Contractor. If any buried utilities not located are exposed, the Contractor shall immediately contact the Owner and the Architect/Engineer. If, after exposing an unlocated buried utility, the Contractor continues digging without notifying Owner and Architect/Engineer and further damages the utility, the Contractor will be fully and solely responsible.

10.3.6. Damage to irrigation systems during seasons of no irrigation that are not immediately and adequately repaired and tested will require the Contractor to return when the system is in service to complete the repair.

10.3.7. In the event of a planned interruption of any existing utility service, the Contractor shall make arrangements with Owner at least 72 hours (3 business days) in advance. Shutdowns of the broadband

or fiber optic cables will normally require 5 working days' notice to the Owner. The Contractor shall bear all costs associated with the interruptions and restorations of service.

ARTICLE 11 - INSURANCE AND BONDS

11.1. CONTRACTOR'S LIABILITY INSURANCE

11.1.1. The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the State of Montana with a rating no less than "A-", such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

11.1.1.1. claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

11.1.1.2. claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

11.1.1.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

11.1.1.4. claims for damages insured by usual personal injury liability coverage;

11.1.1.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting there from;

11.1.1.6. claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

11.1.1.7. claims for bodily injury or property damage arising out of completed operations; and,

11.1.1.8. claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2. The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until termination of any coverage required to be maintained after final payment.

11.1.3. Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies except Workers Compensation required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner. The Workers Compensation policy will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner by the Contractor. If any of the foregoing insurance coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.1.4. At the request of the Owner, the Contractor shall provide copies of all insurance policies to the Owner.

11.2. INSURANCE, GENERAL REQUIREMENTS

11.2.1. The Contractor shall maintain for the duration of the contract, at its cost and expense, insurance against claims for injuries to persons or damages to property, including contractual liability, which may arise from or in connection with the performance of the Work by the Contractor, its agents, employees, representatives, assigns, or subcontractors. The Contractor is responsible for all deductibles regardless of policy or level of coverage. The Owner reserves the right to demand, and the Contractor agrees to provide, copies of any and all policies at any time.

11.2.2. Hold Harmless and Indemnification: The Contractor shall protect, defend, and save the state, its elected and appointed officials, agents, and employees, while acting within the scope of their duties as such, harmless from and against all claims, liabilities, demands, causes of action, and judgments whatsoever (including the cost of defense and reasonable attorney fees): 1) arising in favor of or asserted by third parties on account of damage to property, personal injury, or death which injury, death, or damage; or, 2) arising out of or resulting from performance or failure to perform, or omissions of services, or in any way results from the negligent acts or omissions of the Contractor, its agents, agents, or subcontractors.

11.2.3. Contractor's Insurance: insurance required under all sections herein shall be in effect for the duration of the contract that extends through the warranty period. Insurance required herein shall be provided by insurance policies issued only by insurance companies currently authorized to do business in the state of Montana. No Contractor or Sub-contractor shall commence any Work under this contract until all required insurance has been obtained. During the term of this contract, the Contractor shall, not less than thirty days prior to the expiration date of any policy for which a certificate of insurance is required, deliver to the Owner a certificate of insurance with respect to the renewal insurance policy. The Contractor shall furnish one copy of insurance certificates of insurance herein required, which shall specifically set forth evidence of all coverage required by these contract documents and which shall be signed by authorized representatives of the insurance company or companies evidencing that insurance as required herein is in force with the exception of Workers Compensation and will not be canceled, limited or restricted without thirty days' written notice by certified mail to the contractor and the Owner. The Workers Compensation policy will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner by the Contractor. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Additionally, all certificates shall include the project name and A/E project number.

11.2.4. Certificates of Insurance and Endorsements. All certificates of insurance and the additional insured endorsements are to be received by the state prior to issuance of the Notice to Proceed. The contractor is responsible to ensure that all policies and coverages contain the necessary endorsements for the State being listed as an additional insured. The state reserves the right to require complete copies of all insurance policies at any time to verify coverage. The contractor shall notify the state within 30 days of any material change in coverage.

11.3. WORKERS' COMPENSATION INSURANCE

11.3.1. The Contractor shall carry **Workers' Compensation Insurance**. Such Workers' Compensation Insurance shall protect the Contractor from claims made by his own employees, the employees of any Sub-contractor, and also claims made by anyone directly or indirectly employed by the Contractor or Sub-contractor. The Contractor shall require each Sub-contractor similarly to provide Workers' Compensation Insurance.

11.4. COMMERCIAL GENERAL LIABILITY INSURANCE

11.4.1. Each Contractor shall carry per occurrence coverage **Commercial General Liability Insurance** including coverage for premises; operations; independent contractor's protective; products and completed operations; products and materials stored off-site; broad form property damage and comprehensive automobile liability insurance with not less than the following limits of liability:

11.4.1.1. **$1,000,000 per occurrence; aggregate limit of $2,000,000**;

11.4.2. The **Commercial General and Automobile Liability Insurance** shall provide coverage for both bodily injury, including accidental death, sickness, disease, occupational sickness or disease, personal injury liability coverage and property damage which may arise out of the work under this contract, or operations

incidental thereto, whether such work and operations be by the Contractor or by any Subcontractor or by anyone directly or indirectly employed by the Contractor or by Sub-contractor, or by anyone for whose acts any of them may be liable. The Contractor shall maintain the liability insurance required herein for a period of not less than one year after final payment or anytime the Contractor goes on to the location of the project.

11.4.3. The Contractor's liability insurance policies shall list the STATE OF MONTANA as an additional insured. **AN ADDITIONAL INSURED ENDORSEMENT DOCUMENT SHALL BE SUBMITTED WITH THE CERTIFICATES OF INSURANCE**. The STATE OF MONTANA includes its officers, elected and appointed officials, employees and volunteers and political subdivisions thereof. Should the Contractor not be able to list the state as an additional insured, the Contractor shall purchase a per occurrence Owner's/Contractor's Protective Policy (OCP) with the STATE OF MONTANA as the insured party in the same occurrence and aggregate limits as that indicated above for the Contractor's Commercial General Liability Policy.

11.4.4. Property damage liability insurance shall be written without any exclusion for injury to or destruction of any building, structure, wires, conduits, pipes, or other property above or below the surface of the ground arising out of the blasting, explosion, pile driving, excavation, filling, grading or from the moving, shoring, underpinning, raising, or demolition of any building or structure or structural support thereof.

11.4.5. The Contractor's insurance coverage shall be PRIMARY insurance as respects the State, its officers, elected and appointed officials, employees and volunteers. Any insurance or self-insurance maintained by the state, its officers, elected and appointed officials, employees and volunteers shall be excess of the Contractor's insurance and shall not contribute to it. NO WAIVERS OF SUBROGATION OR ENDORSEMENTS LIMITING, TRANSFERRING, OR OTHERWISE INDEMNIFYING LIABLE OR RESPONSIBLE PARTIES OF THE CONTRACTOR OR ANY SUBCONTRACTOR WILL BE ACCEPTED.

11.5. PROPERTY INSURANCE (ALL RISK)

11.5.1. New Construction (for projects involving new construction): At its sole cost and expense, the contractor shall keep the building and all other improvements on the premises insured throughout the term of the agreement against the following hazards:

11.5.1.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map, NEHRP.pdf (mt.gov) in an amount sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire insurance policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.

11.5.1.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.

11.5.1.3. Loss or damage by explosion of steam boilers, pressure vessels, and oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.

11.5.2. Building Renovation (for projects involving building renovation or remodeling):

11.5.2.1. The contractor shall purchase and maintain Builder's Risk/Installation insurance on a "special causes of loss" form (so called "all risk") for the cost of the work and any subsequent modifications and change orders. The contractor is not responsible for insuring the existing structure for Builder's Risk/Installation insurance.

11.5.2.2. At its sole cost and expense, the contractor shall insure all property construction on the premises throughout the term of the agreement against the following hazards:

11.5.2.2.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map at http://rmtd.mt.gov/Portal/62/aboutus/publications/files/NEHRP.pdf in an amount

sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.

11.5.2.2.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.

11.5.2.2.3. Loss or damage by explosion of steam boilers, pressure vessels, oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.

11.6. ASBESTOS ABATEMENT INSURANCE

11.6.1. If Asbestos Abatement is identified as part of the Work under this contract, the Contractor or any subcontractor involved in asbestos abatement shall purchase and maintain **Asbestos Liability Insurance** for coverage of bodily injury, sickness, disease, death, damages, claims, errors or omissions regarding the asbestos portion of the work ***in addition to*** the CGL Insurance by reason of any negligence in part or in whole, error or omission committed or alleged to have been committed by the Contractor or anyone for whom the Contractor is legally liable.

11.6.2. Such insurance shall be in "per occurrence" form and shall clearly state on the certificate that asbestos work is included in the following limits:

11.6.2.1. **$1,000,000 per occurrence; aggregate limit of $2,000,000.**

11.6.3. Asbestos Liability Insurance as carried by the asbestos abatement subcontractor in these limits in lieu of the Contractor's coverage is acceptable provided the Contractor and the State of Montana are named as additional insureds and that the abatement subcontractor's insurance is PRIMARY as respects both the Owner and the Contractor. If the Contractor or any other subcontractor encounters asbestos, all operations shall be suspended until abatement with the associated air monitoring clearances are accomplished. The certificate of coverage shall be provided by the asbestos abatement subcontractor to both the Contractor and the Owner.

11.7. PERFORMANCE BOND AND LABOR & MATERIAL PAYMENT BOND (BOTH ARE REQUIRED ON THIS PROJECT)

11.7.1. The Contract shall furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract (18-2-201 MCA). The Contractor shall also furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith (18-2-201MCA). The bonds shall be executed on forms furnished by the Owner and no other forms or endorsements will be acceptable. The bonds shall be signed in compliance with state statutes (33-17-1111 MCA). Bonds shall be secured from a state licensed bonding company. Power of Attorney is required with each bond. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney:

11.7.1.1. one original copy shall be furnished with each set of bonds.

11.7.1.2. Others furnished with a set of bonds may be copies of that original.

11.7.2. The Owner reserves the right at any time during the performance of Work to require bonding of Subcontractors provided by the General Contractor. Should this occur, the Owner will cover the direct cost. This shall not be construed as to in any way affect the relationship between the General Contractor and his Subcontractors.

11.7.3. Surety must have an endorsement stating that their guarantee of Contractor's performance automatically covers the additional contract time added to a Contractor's contract by Change Order.

11.7.4. A change in the Contractor's organization shall not constitute grounds for Surety to claim a discharge of their liability and requires an endorsement from Surety so stating.

11.7.5. Except as noted below, the Contractor is required to notify Surety of any increase in the contract amount resulting from a Change Order within 48 hours of signing and submitting a Change Order and shall submit a copy of Surety's written acknowledgment and consent to Owner before a Change Order can be approved. The Surety's written acknowledgment and consent on the Change Order form shall also satisfy this consent requirement.

11.7.5.1. Surety consent shall not be required on Change Order(s) which, in the aggregate total amount of all Changes Orders, increase the original contract amount by less than 10%. However, the Contractor is still required to notify Surety of any increase in contract amount resulting from a Change Order(s) within 48 hours of signing and submitting every Change Order.

11.7.5.2. Surety is fully obligated to the Owner for the full contract amount, inclusive of all Change Orders, regardless of whether or not written acknowledgement and consent is received and regardless of whether or not the aggregate total of all Change Orders is more or less than 10% of the original contract amount.

11.7.5.3. A fax with hard copy to follow of Surety's written acknowledgment and consent is acceptable. If hard copy is not received by Owner before Application for Payment on any portion or all of said Change Order, it will not be accepted by Owner for payment.

11.7.6. The Surety must take action within 30 days of notice of default on the part of the Contractor or of any claim on bonds made by the Owner or any Subcontractor or supplier.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1. UNCOVERING OF WORK

12.1.1. If a portion of the Work is covered contrary to the Architect/Engineer's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect/Engineer, be uncovered for the Architect/Engineer's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2. If a portion of the Work has been covered which the Architect/Engineer has not specifically requested to examine prior to it being covered, the Architect/Engineer may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2. CORRECTION OF WORK

12.2.1. **BEFORE OR AFTER SUBSTANTIAL COMPLETION**

12.2.1.1. The Contractor shall promptly correct Work that fails to conform to the requirements of the Contract Documents or that is rejected by the Architect/Engineer, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect/Engineer's services and expenses made necessary thereby, shall be at the Contractor's expense. The Contractor is responsible to discover and correct all defective work and shall not rely upon the Architect/Engineer's or Owner's observations.

12.2.1.2. Rejection and Correction of Work in Progress. During the course of the Work, the Contractor shall inspect and promptly reject any Work that:

12.2.1.2.1. does not conform to the Construction Documents; or,
12.2.1.2.2. does not comply with any applicable law, statute, building code, rule or regulation of any governmental, public and quasi-public authorities, and agencies having jurisdiction over the Project.

12.2.1.3. The Contractor shall promptly correct or require the correction of all rejected Work, whether observed before or after Substantial Completion. The Contractor shall bear all costs of correcting such Work, including additional testing, inspections, and compensation for all services and expenses necessitated by such corrective action.

12.2.2. **AFTER SUBSTANTIAL COMPLETION AND AFTER FINAL ACCEPTANCE**

12.2.2.1. In addition to the Contractor's obligations under Paragraph 3.5, if, within one year after the date of Final Acceptance of the Work or designated portion thereof or after the date for commencement of warranties, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect/Engineer, the Owner may correct it in accordance with Paragraph 2.3.

12.2.2.1.1. The Contractor shall remedy any and all deficiencies due to faulty materials or workmanship and pay for any damage to other work resulting there from, which shall appear within the period of Substantial Completion through one (1) year from the date of Final Acceptance in accordance with the terms and conditions of the Contract and with any special guarantees or warranties provided in the Contract Documents. The Owner shall give notice of observed deficiencies with reasonable promptness. All questions, claims or disputes arising under this Article shall be decided by the Architect/Engineer. All manufacturer, product and supplier warranties are in addition to this Contractor warranty.

12.2.2.1.2. The Contractor shall respond within seven (7) days after notice of observed deficiencies has been given and he shall proceed to immediately remedy these deficiencies.

12.2.2.1.3. Should the Contractor fail to respond to the notice or not remedy those deficiencies; the Owner shall have this work corrected at the expense of the Contractor.

12.2.2.1.4. Latent defects shall be in addition to those identified above and shall be the responsibility of the Contractor per the statute of limitations for a written contract (27-2-208 MCA) starting from the date of Final Acceptance.

12.2.2.2. The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work.

12.2.2.3. The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2.

12.2.3. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4. The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5. Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within

which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3. ACCEPTANCE OF NONCONFORMING WORK

12.3.1. If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1. GOVERNING LAW

13.1.1. The Contract shall be governed by the laws of the State of Montana and venue for all legal proceedings shall be the First Judicial District, Lewis & Clark County.

13.2. SUCCESSORS AND ASSIGNS

13.2.1. The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempt to make such assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3. WRITTEN NOTICE

13.3.1. Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4. RIGHTS AND REMEDIES

13.4.1. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2. No action or failure to act by the Owner, Architect/Engineer or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5. TESTS AND INSPECTIONS

13.5.1. Quality Control (i.e. ensuring compliance with the Contract Documents) and Quality Assurance (i.e. confirming compliance with the Contract Documents) are the responsibility of the Contractor. Testing, observations, and/or inspections performed or provided by the Owner are solely for the Owner's own purposes and are for the benefit of the Owner. The Owner is not liable or responsible in any form or fashion to the Contractor regarding quality control or assurance or extent of such assurances. The Contractor shall not, under any circumstances, rely upon the Owner's testing or inspections as a substitute or in lieu of its own Quality Control or Assurance programs.

13.5.2. Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect/Engineer timely notice of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. The Owner shall bear

costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.3. If the Architect/Engineer, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.2, the Architect/Engineer will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect/Engineer of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.4 shall be at the Owner's expense.

13.5.4. If such procedures for testing, inspection or approval under Subparagraphs 13.5.2 and 13.5.3 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect/Engineer's services and expenses shall be at the Contractor's expense.

13.5.5. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect/Engineer.

13.5.6. If the Architect/Engineer is to observe tests, inspections or approvals required by the Contract Documents, the Architect/Engineer will do so promptly and, where practicable, at the normal place of testing.

13.5.7. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6. INTEREST

13.6.1. Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7. COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1. As between the Owner and Contractor:

13.7.1.1. **Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

13.7.1.2. **Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and,

13.7.1.3. **After Final Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

13.8. PAYROLL AND BASIC RECORDS

13.8.1. Payrolls and basic records pertaining to the project shall be kept on a generally recognized accounting basis and shall be available to the Owner, Legislative Auditor, the Legislative Fiscal Analyst or his

authorized representative at mutually convenient times. Accounting records shall be kept by the Contractor for a period of three years after the date of the Owner's Final Acceptance of the Project.

ARTICLE 14 – TERMINATION OR SUSPENSION OF THE CONTRACT

14.1. TERMINATION BY THE CONTRACTOR

14.1.1. The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

14.1.1.1. issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped; or,

14.1.1.2. an act of government, such as a declaration of national emergency which requires all Work to be stopped.

14.1.2. The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

14.1.3. If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect/Engineer, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit but not damages.

14.1.4. If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect/Engineer, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2. TERMINATION BY THE OWNER FOR CAUSE

14.2.1. The Owner may terminate the Contract if the Contractor:

14.2.1.1. persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

14.2.1.2. fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

14.2.1.3. persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or,

14.2.1.4. otherwise is guilty of any breach of a provision of the Contract Documents.

14.2.2. When any of the above reasons exist, the Owner, upon certification by the Architect/Engineer that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

14.2.2.1. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

14.2.2.2. accept assignment of subcontracts pursuant to Paragraph 5.4; and,

14.2.2.3. finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

14.2.3. When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4. If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect/Engineer's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect/Engineer, upon application, and this obligation for payment shall survive termination of the Contract.

14.3. SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1. The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2. The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

14.3.2.1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or,

14.3.2.2. that an equitable adjustment is made or denied under another provision of the Contract.

14.4. TERMINATION BY THE OWNER FOR CONVENIENCE

14.4.1. The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.4.2. Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

14.4.2.1. cease operations as directed by the Owner in the notice;

14.4.2.2. take actions necessary, or that the Owner may direct, for the protection and preservation of the Work, and;

14.4.2.3. except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.4.3. In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination. The Contractor shall provide a full and complete itemized accounting of all costs.

ARTICLE 15 – EQUAL OPPORTUNITY

15.1. The Contractor and all Sub-contractors shall not discriminate against any employee or applicant for employment because of race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability and shall comply with all Federal and State laws concerning fair labor standards and hiring practices. The Contractor shall ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or

condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.

15.2. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

15.3. The Contractor and all Sub-contractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.

15.4. The contractor shall not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association, and the Contractor shall not discriminate during the term of the contract against a firearm entity or firearm trade association. This section shall be construed in accordance with 30-20-301, MCA.

15.4.1. The provisions of 30-20-301, MCA apply only to a contract that:

15.4.1.1. is between a governmental entity and a company with at least 10 full-time employees; and

15.4.1.2. has a value of at least $100,000 that is paid wholly or partly from public funds of the governmental entity.

15.4.2. By the signing the contract, the Contractor certifies and affirms:

15.4.2.1. Contractor does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association during the term of this contract; and

15.4.2.2. Contractor will not discriminate against a firearm entity or firearm trade association during the term of this contract.

15.4.3. The contractor's certification is made in compliance with and in reference to 30-20-301, MCA, and the terms defined therein. If the contractor determines the provisions of 30-20-301, MCA don't apply to the contract, the Contractor shall submit a statement set forth in details the basis for such determination.

16. ARTICLE 16 – FEDERAL CONTRACT REQUIREMENTS (The Contractor shall include all these Federal Contract Requirements in all subcontracts and shall require compliance by all subcontractors).

"FEDERAL AGENCY" means the U.S. Government agency who is providing funds for the project.
"OMB" means the federal Office of Management and Budget
"AGENCY" means the State of Montana agency for whom the project is constructed.
"DOA" means the state Department of Administration

16.1. ENVIRONMENTAL POLICY ACT

16.1.1. AGENCY shall review all projects to determine whether there is a need for FEDERAL AGENCY approval under the National Environmental Policy Act (NEPA) and if such approval is determined to be needed, will seek that approval. DOA shall provide building information requested and make documents available to AGENCY to determine NEPA compliance. DOA shall not proceed with those projects where a determination is being requested from FEDERAL AGENCY until such determination has been received and, if informed by AGENCY of the need to stop work, will stop work on a project until compliance is determined. AGENCY shall inform DOA in writing of the need to stop any project that requires NEPA approval and again when work may proceed. AGENCY and DOA shall determine possible impacts and agree to responsibilities and consequences prior to stopping the process and work to avoid impacts.

16.2. HISTORIC PRESERVATION ACT

16.2.1. AGENCY shall review all projects to determine whether there is a need for approval under the Historic Preservation Act and, if so determined, will work with the State Historical Preservation Office to get that

approval. AGENCY shall provide DOA a copy of the Historical Preservation Act agreement signed with FEDERAL AGENCY. DOA shall provide building information and documents requested by AGENCY, become familiar with the signed state agreement, and point out potential historical issues DOA has noticed or is aware of with buildings during the planning phase of a project.

16.3. FEDERAL PREVAILING WAGE AND OTHER REQUIREMENTS - DAVIS-BACON, PAYROLLS, AND BASIC RECORDS

16.3.1. In all construction contracts (including subcontracts) in excess of $2,000 the Contractor and all Subcontractors shall be subject to the federal Davis-Bacon Act (40 USC 276) as supplemented by the U.S. Department of Labor regulations (29 CFR Part 5).

16.3.2. Definitions: For purposes of this article, Davis Bacon Act and Contract Work Hours and Safety Standards Act, the following definitions are applicable:

16.3.2.1. “Award” means any grant, cooperative agreement or technology investment agreement FEDERAL AGENCY to a Recipient. Such Award must require compliance with the labor standards clauses and wage rate requirements of the Davis-Bacon Act (DBA) for work performed by all laborers and mechanics employed by Recipients (other than a unit of State or local government whose own employees perform the construction), Subrecipients, Contractors and subcontractors.

16.3.2.2. “Contractor” means an entity that enters into a Contract. For purposes of these clauses, Contractor shall include (as applicable) prime contractors, Recipients, Subrecipients, and Recipients’ or Subrecipients’ contractors, subcontractors, and lower-tier subcontractors. “Contractor” does not mean a unit of State or local government where construction is performed by its own employees.

16.3.2.3. “Contract” means a contract executed by a Recipient, Subrecipient, prime contractor or any tier subcontractor for construction, alteration, or repair. It may also mean (as applicable) (i) financial assistance instruments such as grants, cooperative agreements, technology investment agreements, and loans; and, (ii) Sub awards, contracts and subcontracts issued under financial assistance agreements. “Contract” does not mean a financial assistance instrument with a unit of State or local government where construction is performed by its own employees.

16.3.2.4. “Contracting Officer” means the FEDERAL AGENCY official authorized to execute an Award on behalf of FEDERAL AGENCY and who is responsible for the business management and non-program aspects of the financial assistance process.

16.3.2.5. “Recipient” means any entity other than an individual that receives an Award of Federal funds in the form of a grant, cooperative agreement or technology investment agreement directly from the Federal Government and is financially accountable for the use of any FEDERAL AGENCY funds or property, and is legally responsible for carrying out the terms and conditions of the program and Award.

16.3.2.6. “Subaward” means an award of financial assistance in the form of money, or property in lieu of money, made under an award by a Recipient to an eligible Subrecipient or by a Subrecipient to a lower- tier subrecipient. The term includes financial assistance when provided by any legal agreement, even if the agreement is called a contract, but does not include the Recipient’s procurement of goods and services to carry out the program nor does it include any form of assistance which is excluded from the definition of “Award” above.

16.3.2.7. “Subrecipient” means a non-Federal entity that expends Federal funds received from a Recipient to carry out a Federal program, but does not include an individual that is a beneficiary of such a program.

16.3.3. Davis Bacon Act

16.3.3.1. Minimum wages.

16.3.3.1.1. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

16.3.3.1.2. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

16.3.3.2. (A) The Contracting Officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

16.3.3.2.1. The work to be performed by the classification requested is not performed by a classification in the wage determination; and

16.3.3.2.2. The classification is utilized in the area by the construction industry; and

16.3.3.2.3. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

16.3.3.2.4. Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

16.3.3.2.5. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

16.3.4. Withholding. The FEDERAL AGENCY or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the FEDERAL AGENCY, Recipient, or Subrecipient, may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

16.3.5. Payrolls and basic records.

16.3.5.1. Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

16.3.5.2. (A) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the FEDERAL AGENCY if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the FEDERAL AGENCY. The payrolls submitted shall set out accurately and completely all

of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the FEDERAL AGENCY if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the FEDERAL AGENCY, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner).

B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

16.3.5.2.1. That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

16.3.5.2.2. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

16.3.5.2.3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 3729 of title 31 of the United States Code.

16.3.5.3. The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the FEDERAL AGENCY or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

16.3.6. Apprentices and trainees.

16.3.6.1. Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and

Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

16.3.6.2. Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

16.3.6.3. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

16.3.7. Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

16.3.8. Contracts and Subcontracts. The Recipient, Subrecipient, the Recipient's and Subrecipient's contractors and subcontractor shall insert in any Contracts the clauses contained herein in(a)(1) through (10) and such other clauses as the FEDERAL AGENCY may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of the paragraphs in this clause.

16.3.9. Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

16.3.10. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

16.3.11. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Recipient, Subrecipient, the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

16.3.12. Certification of eligibility.

16.3.12.1. By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

16.3.12.2. No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

16.3.12.3. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

16.4. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

16.4.1. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

16.4.2. Overtime requirements. No Contractor or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

16.4.3. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

16.4.4. Withholding for unpaid wages and liquidated damages. The FEDERAL AGENCY or the Recipient or Sub-recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work

performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

16.4.5. Contracts and Subcontracts. The Recipient, Sub-recipient, and Recipient's and Sub-recipient's contractor or subcontractor shall insert in any Contracts, the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

16.4.6. The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the Contract for all laborers and mechanics, including guards and watchmen, working on the Contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the FEDERAL AGENCY and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

16.5. EQUAL OPPORTUNITY – COMPLIANCE WITH EO 11246 (EEO)

16.5.1. If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with the subparagraphs below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause. During performing this contract, the Contractor agrees as follows:

16.5.2. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

16.5.3. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

16.5.4. The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain the clause.

16.5.5. The Contractor shall, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

16.5.6. The Contractor shall send, to each labor union or representative or workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause and post copies of the notice in conspicuous places available to employees and applicants for employment.

16.5.7. The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

16.5.8. The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 12 months preceding the date of award.

16.5.9. The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

16.5.10. If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

16.5.11. The Contractor shall include the terms and conditions of subparagraph b.(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

16.5.12. The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

16.5.13. Executive Order 11246 as Amended by Executive Order 11375. Compliance with executive order 11246, entitled "Equal Employment Opportunity," as amended by executive order 11375, and as supplemented in Department of Labor Regulations (41 CFR Chapter 60). During the performance of this contract the Contractor agrees as follows:

16.5.13.1. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

16.5.13.2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, or national origin.

16.5.13.3. The Contractor will send to each labor union or representative of workers with which he has a collection bargaining agreement or other contract or understanding, the Notice regarding “Affirmative Action to Ensure Equal Employment Opportunity”, advising the labor union or workers' representative of the Contractor's commitments under Section 202, of Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

16.5.13.4. The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) and of the rules, regulations, and relevant orders of the Secretary of Labor.

16.5.13.5. The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and

accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

16.5.14. The Secretary of Labor may direct that any bidder or prospective contractor shall submit, as part of his Compliance Report, a statement in writing, signed by an authorized officer or agent on behalf of any labor union or any agency referring workers or providing or supervising apprenticeship or other training, with which the bidder or prospective contractor deals, with supporting information, to the effect that the signer's practices and policies do not discriminate on the grounds of race, color, religion, sex, or national origin, and that the signer either will affirmatively cooperate in the implementation of the policy and provisions of this order or that it consents and agrees that recruitment, employment, and the terms and conditions of employment under the proposed contract shall be in accordance with the purposes and provisions of the order. In the event that the union or the agency shall refuse to execute such a statement, the Compliance Report shall so certify and set forth what efforts have been made to secure such a statement and such additional factual material as the contracting agency or the Secretary of Labor may require.

16.5.15. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) and such remedies invoked as provided in Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) or by rules, regulations, or by order of the Secretary of Labor, or as otherwise provided by law.

16.5.16. The Contractor will include the provisions of the foregoing paragraphs in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1985, as amended by Executive Order No. 11375 supplemented by Department of Labor regulations (41 CFR Chapter 60) so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency. The contractor may request the United States to enter into such litigation to protect the interest of the United States.

16.5.17. Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

16.5.18. NON-SEGREGATION. By the submission of this bid, the Contractor agrees to the following:

"By submission of my bid for this project, I certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any locations, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the equal opportunity clause of this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise. I further agree that I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the equal opportunity clause, that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors."

16.6. COPELAND ANTI-KICKBACK ACT (18 U.S.C. 874)

16.6.1. This act provides that each contractor or sub-contractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work to give up any part of the compensation to which he is otherwise entitled. Whoever, by force, intimidation, or threat of procuring dismissal from employment, or by any other manner whatsoever induces any person employed in the construction, prosecution, completion or repair of any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, to give up any part of the compensation to which he is entitled under his contract of employment, shall be fined under this title or imprisoned not more than five years, or both.

16.7. WASTE MANAGEMENT PLAN

16.7.1. Contractor shall be responsible for lawful disposal of lamps, ballasts, mercury- containing thermostats, asbestos, and all other wastes and shall require the same of their subcontractors. The Contractor and all subcontractors shall identify the types and amounts of materials to be recycled or disposed of using the "Waste Material Disposition Worksheet" form. The form must be completed prior to the first billing with an estimate of waste to be disposed, and again with information on the volume of wastes actually disposed of must be provided to the Owner no later than the time of the final billing.

16.8. DEBARMENT AND SUSPENSION (E.O.s 12549 and 12689)

16.8.1. No contract award may be made to a Contractor or any subcontractor that is federally debarred, suspended or proposed for debarment in accordance with Public Law 103-355, Section 2455 (31 USC 6101) and Executive Order 12689. The Contractor who is awarded this contract hereby certifies and confirms by signature on the contract, that neither the Contractor, its principals, their subcontractors nor their principals: (1) are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from the award of contracts by any federal department or agency; (2) have within a 3-year period preceding any partially or wholly federally-funded contract has been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) contract or subcontract; (3) been in violation of federal or state antitrust statutes, or been convicted of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in (2) or (3) above; and, (4) have within a 3-year period preceding an award of any partially or wholly federally-funded contract, had one or more contracts terminated for cause or default by any federal or state agency.

16.8.2. In accordance with Public Law 103-355, Section 2455 (31 U.S.C. 6101, note), and Executive Order 12689, any debarment, suspension or other Government-wide exclusion initiated under the Non-procurement Common Rule implementing Executive Order 12549 on or after August 25, 1995, shall be recognized by and effective as a debarment or suspension under this subpart. Similarly, any debarment, suspension, proposed debarment or other Government-wide exclusion initiated on or after August 25, 1995, under this subpart shall also be recognized by and effective for those agencies and participants as an exclusion under the Non-procurement Common Rule.

16.8.3. Contractors debarred, suspended, or proposed for debarment are excluded from receiving contracts, and agencies shall not solicit offers from, award contracts to, or consent to subcontracts with these contractors. Contractors debarred, suspended, or proposed for debarment are also excluded from conducting business with the Government as agents or representatives of other contractors.

16.8.3.1. Contractors included in the EPLS as having been declared ineligible on the basis of statutory or other regulatory procedures are excluded from receiving contracts, and if applicable, subcontracts, under the conditions and for the period set forth in the statute or regulation. Agencies shall not solicit offers from, award contracts to, or consent to subcontracts with these contractors under those conditions and for that period.

16.8.3.2. Contractors debarred, suspended, or proposed for debarment are excluded from acting as individual sureties.

16.8.3.3. After the opening of bids or receipt of proposals, the contracting officer shall review the EPLS.

16.8.3.3.1. Bids received from any listed contractor in response to an invitation for bids shall be entered on the abstract of bids, and rejected.

16.8.3.3.2. Proposals, quotations, or offers received from any listed contractor shall not be evaluated for award or included in the competitive range, nor shall discussions be conducted with a listed offeror during a period of ineligibility, unless the agency head determines, in writing, that there is a compelling reason to do so. If the period of ineligibility expires or is terminated prior to award, the contracting officer may, but is not required to, consider such proposals, quotations, or offers.

16.8.3.3.3. Immediately prior to award, the contracting officer shall again review the EPLS to ensure that no award is made to a listed contractor.

16.8.4. Protecting the Government's Interest When Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment.

16.8.4.1. The Contractor shall not enter into any subcontract in excess of $30,000 with a Contractor or Subcontractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

16.8.4.2. The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed $30,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

16.8.4.3. A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment. The notice must include the following:

16.8.4.3.1. The name of the subcontractor.

16.8.4.3.2. The Contractor's knowledge of the reasons for the subcontractor being in the Excluded Parties List System.

16.8.4.3.3. The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion in the Excluded Parties List System.

16.8.4.3.4. The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

16.9. INTELLECTUAL PROPERTY AND RIGHTS TO INVENTIONS MADE UNDER A CONTRACT OR AGREEMENT (37 CFR 401)

16.9.1. Contractor may copyright any work that is subject to copyright and was developed, or for which ownership was purchased, under this Contract. The FEDERAL AGENCY provided funding through AGENCY either in whole or in part for this Contract and so reserves a royalty-free, non-exclusive, and irrevocable right to reproduce, publish, or otherwise use the work for federal purposes and to authorize others to do so.

16.9.2. The FEDERAL AGENCY has the right to: (1) obtain, reproduce, publish, or otherwise use the data first produced under this Contract; and, (2) authorize others to receive, reproduce, publish, or otherwise use such data for federal purposes.

16.9.3. Contractor is subject to applicable regulations governing patents and inventions, including government-wide regulations issued by the federal Department of Commerce at 37 CFR 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements."

16.9.4. Invention Disclosure, Election of Title and Filing of Patent Application by Contractor.

16.9.4.1. The contractor will disclose each subject invention to the appropriate Federal Agency within two months after the inventor discloses it in writing to contractor personnel responsible for patent matters. The disclosure to the agency shall be in the form of a written report and shall identify the contract under which the invention was made and the inventor(s). It shall be

sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the agency, the Contractor will promptly notify the agency of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the contractor.

16.9.4.2. The Contractor will elect in writing whether or not to retain title to any such invention by notifying the appropriate Federal agency within two years of disclosure to the appropriate Federal agency. However, in any case where publication, on sale or public use has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period.

16.9.4.3. The contractor will file its initial patent application on a subject invention to which it elects to retain title within one year after election of title or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. The contractor will file patent applications in additional countries or international patent offices within either ten months of the corresponding initial patent application or six months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

16.9.4.4. Requests for extension of the time for disclosure, election, and filing under the above subparagraphs may, at the discretion of the agency, be granted.

16.9.5. Conditions When the Government May Obtain Title. The contractor will convey to the Federal agency, upon written request, title to any subject invention.

16.9.5.1. If the contractor fails to disclose or elect title to the subject invention within the times specified, or elects not to retain title; provided that the agency may only request title within 60 days after learning of the failure of the contractor to disclose or elect within the specified times.

16.9.5.2. In those countries in which the contractor fails to file patent applications within the times specified; provided, however, that if the contractor has filed a patent application in a country after the times specified, but prior to its receipt of the written request of the Federal agency, the contractor shall continue to retain title in that country.

16.9.5.3. In any country in which the contractor decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a subject invention.

16.9.6. Minimum Rights to Contractor and Protection of the Contractor Right to File

16.9.6.1. The contractor will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the contractor fails to disclose the invention within the times specified. The contractor's license extends to its domestic subsidiary and affiliates, if any, within the corporate structure of which the contractor is a party and includes the right to grant sublicenses of the same scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of the Federal agency except when transferred to the successor of that party of the contractor's business to which the invention pertains.

16.9.6.2. The contractor's domestic license may be revoked or modified by the funding Federal agency to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR part 404 and agency licensing regulations (if any). This license will not be revoked in that field of use or the geographical areas in which the contractor has achieved

practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of the funding Federal agency to the extent the contractor, its licensees, or the domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

16.9.6.3. Before revocation or modification of the license, the funding Federal agency will furnish the contractor a written notice of its intention to revoke or modify the license, and the contractor will be allowed thirty days (or such other time as may be authorized by the funding Federal agency for good cause shown by the contractor) after the notice to show cause why the license should not be revoked or modified. The contractor has the right to appeal, in accordance with applicable regulations in 37 CFR part 404 and agency regulations (if any) concerning the licensing of Government-owned inventions, any decision concerning the revocation or modification of the license.

16.9.7. Contractor Action to Protect the Government's Interest

16.9.7.1. The contractor agrees to execute or to have executed and promptly deliver to the Federal agency all instruments necessary to (i) establish or confirm the rights the Government has throughout the world in those subject inventions to which the contractor elects to retain title, and (ii) convey title to the Federal agency when requested herein above and to enable the government to obtain patent protection throughout the world in that subject invention.

16.9.7.2. The contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the contractor each subject invention made under contract in order that the contractor can comply with the disclosure provisions herein above, and to execute all papers necessary to file patent applications on subject inventions and to establish the government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required herein above. The contractor shall instruct such employees through employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

16.9.7.3. The contractor will notify the Federal agency of any decisions not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than thirty days before the expiration of the response period required by the relevant patent office.

16.9.7.4. The contractor agrees to include, within the specification of any United States patent applications and any patent issuing thereon covering a subject invention, the following statement, ``This invention was made with government support under (identify the contract) awarded by (identify the Federal agency). The government has certain rights in the invention.''

16.9.8. Subcontracts

16.9.8.1. The contractor will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental or research work to be performed by a small business firm or domestic nonprofit organization. The subcontractor will retain all rights provided for the contractor in this clause, and the contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

16.9.8.2. The contractor will include in all other subcontracts, regardless of tier, for experimental developmental or research work the patent rights clause required.

16.9.8.3. In the case of subcontracts, at any tier, when the prime award with the Federal agency was a contract (but not a grant or cooperative agreement), the agency, subcontractor, and the contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and the Federal agency with respect to the matters covered

by the clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under this clause.

16.9.9. Reporting on Utilization of Subject Inventions. The Contractor agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the contractor, and such other data and information as the agency may reasonably specify. The contractor also agrees to provide additional reports as may be requested by the agency in connection with any march-in proceeding undertaken by the agency in accordance with this clause. As required by 35 U.S.C. 202(c)(5), the agency agrees it will not disclose such information to persons outside the government without permission of the contractor.

16.9.10. Preference for United States Industry. Notwithstanding any other provision of this clause, the contractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject inventions in the United States unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by the Federal agency upon a showing by the contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

16.9.11. March-in Rights. The contractor agrees that with respect to any subject invention in which it has acquired title, the Federal agency has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency to require the contractor, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the contractor, assignee, or exclusive licensee refuses such a request the Federal agency has the right to grant such a license itself if the Federal agency determines that:

16.9.11.1. Such action is necessary because the contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use.

16.9.11.2. Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the contractor, assignee or their licensees;

16.9.11.3. Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the contractor, assignee or licensees; or

16.9.11.4. Such action is necessary because the agreement required by this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

16.10. SITE VISITS

16.10.1. The Contractor shall provide the Owner, Architect/Engineer, AGENCY, and FEDERAL AGENCY access to the Work at all times wherever located.

16.11. ACCOUNTING, AUDITING, RECORD RETENTION, COST PRINCIPLES, AND ACCESS TO RECORDS (10 CFR 600.21, and 600.242)

16.11.1. In addition to the access to records provisions of 10 CFR 600.21 and 600.242 and in accordance with the provisions of Section 1515 of the Recovery Act, Contractor shall maintain books, records, documents, other evidence directly pertinent to performance of work under this Contract and current accounting for all funds received and expended pursuant to this Contract in accordance with generally accepted accounting principles and to comply with the cost principles contained in OBM Circular 87 to determine allowable costs. Contractor shall comply with all requirements in 10 CFR 600.242 relating to

recordkeeping. Contractor's accounting system must be able to allocate costs associated with this Contract in a manner that keeps these costs separate from the costs of other Contracts. In addition, OMB guidance requires that financial and accounting system be able to segregate, track and maintain these funds apart and separate from other revenue streams.

16.11.2. The Agency, the Legislative Auditor, the FEDERAL AGENCY, the Comptroller General of the United States, or any of their authorized representatives, shall have the right of access to accounting records of Contractor for purposes of making an inspection, audit, excerpts, or transcripts of funds received and expended by Contractor pursuant to this Contract. Notwithstanding the provisions of the Termination Section of this Contract, this Contract may be terminated upon any refusal of Contractor to allow access to records necessary to carry out the audit and analysis referred to above (ref. 18-1-118, MCA). Authorized representatives shall have access to records at any reasonable time for as long as Contractor maintains the records. Audits conducted under this provision shall be in accordance with generally accepted auditing standards as established by the American Institute of Certified Public Accountants and with established procedures and guidelines of the reviewing or auditing company or agency.

16.11.3. Contractor agrees to disclose all information and reports resulting from access to the records maintained in this clause to any of the agencies referred to in this clause.

16.11.4. Contractor agrees to retain all financial records for three years as required by the United States government. Contractor agrees this period meets the requirements of state and federal law with respect to funding utilized. In addition, Contractor agrees to maintain any records relating to any litigation, claim, negotiation, audit, cost recovery, or other action involving the records, until completion of the action and resolution of all issues, or until the end of the three-year period, whichever is longer. Contractor may not destroy any records without first offering the records to the Agency.

16.11.5. In the event that an audit shows that Contractor has not complied with federal or state laws and rules concerning the handling and expenditure of the funds received under this Contract, Contractor agrees to correct the areas of non-compliance within six months after Contractor receives the audit report.

16.11.6. If Contractor receives a total of $500,000 or more in federal funds from any and all sources of federal funding sources during any fiscal year during which this Contract is performed, it must comply with the accounting and audit requirements of the most current version of the Federal Office of Management and Budget (OMB) Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations" and OMB Circular A-87 "Cost Principles for State and Local Governments and Indian Tribal Governments" including the "Compliance Supplement for Single Audits," concerning the use of the funds provided under this Contract.

16.11.7. Contractor must provide with a copy of its annual or biennial audit report covering the year in question within 30 days after the report's issuance. The audit report must include all of the following information:

16.11.7.1. Federal grantor/pass-through grantor program title;

16.11.7.2. Federal CFDA number;

16.11.7.3. Pass-through grantor's number or this Contract number;

16.11.7.4. Program or award amount;

16.11.7.5. Cash accrued or deferred revenue at July 1 or the first day of Contractor's fiscal year;

16.11.7.6. Receipts or revenue recognized during the period;

16.11.7.7. Total disbursements/expenditures;

16.11.7.8. Cash accrued or deferred revenue at June 30 or the last day of Contractor's fiscal year; and,

16.11.7.9. An indication of the basic accounting used in determining the above information in a footnote to the schedule of federal financial awards.

16.11.8. If Contractor receives less than $500,000 in total federal assistance during any fiscal year during which this Contract is performed, and therefore does not need to submit an audit report to AGENCY, Contractor must notify AGENCY in writing within 30 days after the end of that year.

16.11.9. Contractor agrees to incorporate all these paragraphs in any subcontract it awards in excess of $5,000, at any tier, and in all change orders directly related to project performance.

16.11.10. All records maintained pursuant to this Section shall be available and present in proper form within 30 days of a written request made by AGENCY.

16.12. FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS

16.12.1. The Contractor and all subcontractors must comply with applicable federal, state, and municipal laws, codes, and regulations for work performed under this Contract. The Contractor and any subcontractor must, in performance of work under this contract, fully comply with all applicable federal, state, or local laws, rules and regulations, including the Montana Human Rights Act, Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendment of 1972, and the Fair Housing Act. Any subletting or subcontracting by the Contractor subjects subcontractors to the same provision. In accordance with section 49-3-207, MCA, the Contractor agrees that the hiring of persons to perform the contract will be made on the basis of merit and qualifications and there will be no discrimination based upon race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin by the persons performing the contract.

16.13. PROTECTION OF WHISTLEBLOWERS

16.13.1. In accordance with section 1553 of the Recovery Act, Contractor and subcontractor employees may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing, including a disclosure made in the ordinary course of an employee's duties, to the Recovery Accountability and Transparency Board, an inspector general, the Comptroller General, a member of Congress, a State or Federal regulatory or law enforcement Agency, a person with supervisory authority over the employee, a court or grand jury, the head of a Federal agency, or their representatives, information that the employee reasonably believes is evidence of (1) gross mismanagement of an agency contract or grant relating to grant funds; (2) a gross waste of covered funds; (3) a substantial and specific danger to public health or safety related to implementation or use of grant funds; (4) an abuse of authority related to implementation or use of covered funds; or (5) a violation of law, rule, or regulation related to a grant awarded or issued relating to covered funds.

16.14. FALSE CLAIMS

16.14.1. Contractor and subcontractors agree to promptly refer to FEDERAL AGENCY's Inspector General any credible evidence that a principal, employee, agent, contractor, subcontractor, loan recipient, or other person has submitted a false claim under the federal False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity, or similar misconduct involving funds provided under this grant or sub-grants awarded by the AGENCY.

16.15. DRUG-FREE WORKPLACE

16.15.1. Contractor agrees to maintain a drug-free workplace. Contractor certifies, by signing this Contract, its employees and subcontractors will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the performance of this Contract.

16.16. TRAFFICKING VICTIM PROTECTION ACT OF 2000

16.16.1. Contractor and any subcontractor must not engage in forms of trafficking in persons during the period of time that the award is in effect; procure a commercial sex act during the period of time that the award is in effect; or use forced labor in the performance of subcontract award.

16.17. BYRD ANTI-LOBBYING AMENDMENT (31 U.S.C. 1352).

16.17.1. Contractors who apply or bid for an award of $100,000 or more shall file the required certification to the State and shall collect all certifications from all subcontractors as required by this paragraph.

16.17.2. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

16.17.3. Certification. The certification shall contain the following language and signature:

16.17.3.1. The undersigned certifies, to the best of his or her knowledge and belief, that:

16.17.3.1.1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

16.17.3.1.2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ``Disclosure Form to Report Lobbying,'' in accordance with its instructions; and,

16.17.3.1.3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

16.17.3.2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $11,000 and not more than $110,000 for each such failure. The undersigned states, to the best of his or her knowledge and belief, that:

16.17.3.2.1. If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, ``Disclosure Form to Report Lobbying,'' in accordance with its instructions.

16.17.3.2.2. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $11,000 and not more than $110,000 for each such failure.

16.18. COPYRIGHT AND RIGHT TO USE

16.18.1. Any discovery or invention made, or data or text developed, or under development, as a result of work conducted under this Contract, is subject to FEDERAL AGENCY requirements and regulations pertaining to reporting and patent rights, and copyrights and rights in data. In any event, AGENCY and FEDERAL AGENCY shall have a royalty-free, nonexclusive, and irrevocable right to reproduce, publish or otherwise use and authorize others to use, any patented or copyrightable property developed under this Contract.

16.19. SUBCONTRACTING UNDER DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM (10 CFR 600.7 and 600.236)

16.19.1. Contractor shall take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

16.19.2. Affirmative steps shall include:

16.19.2.1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists.

16.19.2.2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources.

16.19.2.3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises.

16.19.2.4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises.

16.19.2.5. Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce.

16.20. PRESERVATION OF OPEN COMPETITION AND GOVERNMENT NEUTRALITY TOWARD CONTRACTOR'S LABOR RELATIONS ON FEDERALLY FUNDED CONSTRUCTION PROJECTS

16.20.1. No bidder, offeror, contractor, or subcontractor shall require or be required to enter into or adhere to agreements with one or more labor organizations for any work on this or other related construction project(s); or

16.20.2. Shall otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories or otherwise adhere to agreements with one or more labor organizations, on the same or other related construction project(s).

16.20.3. Nothing in this provision prohibits bidders, offerors, contractors, or subcontractors from voluntarily entering into agreements with labor organizations.

16.21. PUBLICATIONS

16.21.1. An acknowledgment of Federal support and a disclaimer must appear in the publication of any material, whether copyrighted or not, based on or developed under this project, as follows:

16.21.1.1. Acknowledgment: "This material is based upon work supported by the FEDERAL AGENCY under Award Number(s) *DE-EE0000138*."

16.21.1.2. Disclaimer: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its

endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

16.22. OWNERSHIP OF EQUIPMENT, SUPPLIES AND MATERIALS (10 CFR 600.232)

16.22.1. In accordance with 10 CFR 600.232, title of equipment, defined as having a purchase price of over $5,000 and a useful life of more than one year, acquired under this Contract, shall vest with Contractor. Contractor agrees to maintain the equipment in good working condition and provide accountability of the equipment per state law and rule concerning Asset Management.

16.23. NOTICE ON THE RESTRICTION OF TRADE SECRETS

16.23.1. Notice of Restriction on Trade Secrets and Publication: Recovery Act sub award applications may contain technical data and other data, including trade secrets and/or privileged or confidential information, which the applicant does not want disclosed to the public or used by the Government for any purpose other than the application. To protect such data, the applicant should specifically identify each page including each line or paragraph thereof containing the data to be protected and mark the cover sheet of the application with the following Notice as well as referring to the Notice on each page to which the Notice applies:

"Notice of Restriction on Disclosure and Use of Data The data contained in pages ---- of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, FEDERAL AGENCY shall have the right to use or disclose the data here to the extent provided in the award. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the applicant."

16.24. CLEAN AIR AND WATER

16.24.1. "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401 et seq.).

16.24.2. "Clean air standards," as used in this clause, means:

16.24.2.1. Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

16.24.2.2. An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

16.24.2.3. An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d); or,

16.24.2.4. An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)). "Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

16.24.3. "Compliance," as used in this clause, means:

16.24.3.1. compliance with Clean air or water standards; or

16.24.3.2. A schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

16.24.4. A Facility, as used in this clause, means: Any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designer, of the Environmental Protection Agency, determines that independent facilities are collected in one geographical area.

16.24.5. "Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251 et seq.).

16.24.6. The Contractor agrees:

16.24.6.1. To comply with all the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

16.24.6.2. That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

16.24.6.3. To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and,

16.24.6.4. To insert the substance of this clause into any nonexempt subcontract.

16.25. REMEDIES FOR BREACH OF CONTRACT & TERMINATION FOR CAUSE

16.25.1. See Article 14 of these General Conditions.

[END OF GENERAL CONDITIONS]

MONTANA
PREVAILING WAGE RATES FOR HEAVY CONSTRUCTION SERVICES 2024

Effective: January 13, 2024

Greg Gianforte, Governor
State of Montana

Sarah Swanson, Commissioner
Department of Labor & Industry

To obtain copies of prevailing wage rate schedules, or for information relating to public works projects and payment of prevailing wage rates, visit ERD at erd.dli.mt.gov/labor-standards or contact:

Employment Relations Division
Montana Department of Labor and Industry
P. O. Box 8011
Helena, MT 59620-1503
Phone 406-444-6543

The department welcomes questions, comments, and suggestions from the public. In addition, we'll do our best to provide information in an accessible format, upon request, in compliance with the Americans with Disabilities Act.

MONTANA PREVAILING WAGE REQUIREMENTS

The Commissioner of the Department of Labor and Industry, in accordance with Sections 18-2-401 and 18-2-402 of the Montana Code Annotated (MCA), has determined the standard prevailing rate of wages for the occupations listed in this publication.

The wages specified herein control the prevailing rate of wages for the purposes of Section 18-2-401, et seq., MCA. It is required each employer pay (as a minimum) the rate of wages, including fringe benefits, travel allowance, zone pay and per diem applicable to the district in which the work is being performed as provided in the attached wage determinations.

All Montana Prevailing Wage Rates are available on the internet at erd.dli.mt.gov/labor-standards or by contacting the department at (406) 444-6543.

In addition, this publication provides general information concerning compliance with Montana's Prevailing Wage Law and the payment of prevailing wages. For detailed compliance information relating to public works contracts and payment of prevailing wage rates, please consult the regulations on the internet at erd.dli.mt.gov/labor-standards or contact the department at (406) 444-6543.

SARAH SWANSON
Commissioner
Department of Labor and Industry
State of Montana

TABLE OF CONTENTS

MONTANA PREVAILING WAGE REQUIREMENTS:

WAGE RATES:

A. Date of January 13, 2024

B. Definition of Heavy Construction

The Administrative Rules of Montana (ARM), 24.17.501(4) – (4)(a), states *"Heavy construction projects include, but are not limited to, those projects that are not properly classified as either 'building construction', or 'highway construction.'*

Heavy construction projects include, but are not limited to, antenna towers, bridges (major bridges designed for commercial navigation), breakwaters, caissons (other than building or highway), canals, channels, channel cut-offs, chemical complexes or facilities (other than buildings), cofferdams, coke ovens, dams, demolition (not incidental to construction), dikes, docks, drainage projects, dredging projects, electrification projects (outdoor), fish hatcheries, flood control projects, industrial incinerators (other than building), irrigation projects, jetties, kilns, land drainage (not incidental to other construction), land leveling (not incidental to other construction), land reclamation, levees, locks and waterways, oil refineries (other than buildings), pipe lines, ponds, pumping stations (prefabricated drop-in units – not buildings), railroad construction, reservoirs, revetments, sewage collection and disposal lines, sewers (sanitary, storm, etc.), shoreline maintenance, ski tows, storage tanks, swimming pools (outdoor), subways (other than buildings), tipples, tunnels, unsheltered piers and wharves, viaducts (other than highway), water mains, waterway construction, water supply lines (not incidental to building), water and sewage treatment plants (other than buildings) and wells."

C. Definition of Public Works Contract

Section 18-2-401(11)(a), MCA defines "public works contract" as *"…a contract for construction services let by the state, county, municipality, school district, or political subdivision or for nonconstruction services let by the state, county, municipality, or political subdivision in which the total cost of the contract is in excess of $25,000…"*.

D. Prevailing Wage Schedule

This publication covers only Heavy Construction occupations and rates in the specific localities mentioned herein. These rates will remain in effect until superseded by a more current publication. Current prevailing wage rate schedules for Building Construction, Highway Construction and Nonconstruction Services occupations can be found on the internet at www.mtwagehourbopa.com or by contacting the department at (406) 444-6543.

E. Rates to Use for Projects

ARM, 24.17.127(1)(c), states *"The wage rates applicable to a particular public works project are those in effect at the time the bid specifications are advertised."*

F. Wage Rate Adjustments for Multiyear Contracts

Section 18-2-417, MCA states:

"(1) Any public works contract that by the terms of the original contract calls for more than 30 months to fully perform must include a provision to adjust, as provided in subsection (2), the standard prevailing rate of wages to be paid to the workers performing the contract.

(2) The standard prevailing rate of wages paid to workers under a contract subject to this section must be adjusted 12 months after the date of the award of the public works contract. The amount of the adjustment must be a 3% increase. The adjustment must be made and applied every 12 months for the term of the contract.

(3) Any increase in the standard rate of prevailing wages for workers under this section is the sole responsibility of the contractor and any subcontractors and not the contracting agency."

G. Fringe Benefits

Section 18-2-412, MCA states:

"(1) To fulfill the obligation…a contractor or subcontractor may:

(a) pay the amount of fringe benefits and the basic hourly rate of pay that is part of the standard prevailing rate of wages directly to the worker or employee in cash;

(b) make an irrevocable contribution to a trustee or a third person pursuant to a fringe benefit fund, plan, or program that meets the requirements of the Employee Retirement Income Security Act of 1974 or that is a bona fide program approved by the U. S. department of labor; or

(c) make payments using any combination of methods set forth in subsections (1)(a) and (1)(b) so that the aggregate of payments and contributions is not less than the standard prevailing rate of wages, including fringe benefits and travel allowances, applicable to the district for the particular type of work being performed.

(2) The fringe benefit fund, plan, or program described in subsection (1)(b) must provide benefits to workers or employees for health care, pensions on retirement or death, life insurance, disability and sickness insurance, or bona fide programs that meet the requirements of the Employee Retirement Income Security Act of 1974 or that are approved by the U. S. department of labor."

Fringe benefits are paid for all hours worked (straight time and overtime hours). However, fringe benefits are not to be considered a part of the hourly rate of pay for calculating overtime, unless there is a collectively bargained agreement in effect that specifies otherwise.

H. Dispatch City

ARM, 24.17.103(11), defines dispatch city as *"…the courthouse in the city from the following list which is closest to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, Miles City, Missoula and Sidney."*

I. Zone Pay

Zone pay is not travel pay. ARM, 24.17.103(24), defines zone pay as *"…an amount added to the base pay; the combined sum then becomes the new base wage rate to be paid for all hours worked on the project. Zone pay must be determined by measuring the road miles one way over the shortest practical maintained route from the dispatch city to the center of the job."* See section H above for a list of dispatch cities.

J. Computing Travel Benefits

ARM, 24.17.103(22), states *" 'Travel pay,' also referred to as 'travel allowance,' is and must be paid for travel both to and from the job site, except those with special provisions listed under the classification. The rate is determined by measuring the road miles one direction over the shortest practical maintained route from the dispatch city or the employee's home, whichever is closer, to the center of the job."* See section H above for a list of dispatch cities.

K. Per Diem

ARM, 24.17.103(19), states *" 'Per diem' typically covers costs associated with board and lodging expenses. Per diem is paid when an employee is required to work at a location outside the daily commuting distance and is required to stay at that location overnight or longer."*

L. Apprentices

Wage rates for apprentices registered in approved federal or state apprenticeship programs are contained in those programs. Additionally, Section 18-2-416(2), MCA states, *"…The full amount of any applicable fringe benefits must be paid to the apprentice while the apprentice is working on the public works contract."* Apprentices not registered in approved federal or state apprenticeship programs will be paid the appropriate journey level prevailing wage rate when working on a public works contract.

M. Posting Notice of Prevailing Wages

Section 18-2-406, MCA, provides that contractors, subcontractors, and employers who are *"...performing work or providing construction services under public works contracts, as provided in this part, shall post in a prominent and accessible site on the project or staging area, not later than the first day of work and continuing for the entire duration of the project, a legible statement of all wages and fringe benefits to be paid to the employees."*

N. Employment Preference

Sections 18-2-403 and 18-2-409, MCA require contractors to give preference to the employment of bona fide Montana residents in the performance of work on public works contracts.

O. Projects of a Mixed Nature

Section 18-2-408, MCA states:

"(1) The contracting agency shall determine, based on the preponderance of labor hours to be worked, whether the public works construction services project is classified as a highway construction project, a heavy construction project, or a building construction project.

(2) Once the project has been classified, employees in each trade classification who are working on that project must be paid at the rate for that project classification"

P. Occupations Definitions

You can find definitions for these occupations on the following Bureau of Labor Statistics website:
http://www.bls.gov/oes/current/oes_stru.htm

Q. Welder Rates

Welders receive the rate prescribed for the craft performing an operation to which welding is incidental.

R. Foreman Rates

Rates are no longer set for foremen. However, if a foreman performs journey level work, the foreman must be paid at least the journey level rate.

S. Proper Classification for Pipefitter and Laborer/Pipelayer Work on Water and Waste Water Treatment Plants The proper classification for the following work is Pipefitter, when it is performed inside a building structure or performed at a location which will later be inside of a building: Joining steel pipe larger than 12 inches in diameter with bolted flange connections that has been pre-fabricated off site and does not require any modification such as cutting, grinding, welding, or other fabrication in order to be installed. All other work previously classified as pipefitter remains in that classification. The proper classification for that work when it is at a location that will always be outside a building is Pipelayer, which is under the Laborer Group 3 classification.

WAGE RATES

BOILERMAKERS

Wage	Benefit
$35.30	$30.94

Duties Include:
Construct, assemble, maintain, and repair stationary steam boilers, boiler house auxiliaries, process vessels, pressure vessels and penstocks. Bulk storage tanks and bolted steel tanks.

Travel and Per Diem:
No travel or per diem established.

↑ Back to Table of Contents

BRICK, BLOCK, AND STONE MASONS

Wage	Benefit
$32.32	$16.78

Travel:
0-70 mi. free zone
>70-90 mi. $60.00/day
>90 mi. $80.00/day

↑ Back to Table of Contents

CARPENTERS

Wage	Benefit
$34.50	$14.07

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $4.00/hr.
>60 mi. base pay + $6.00/hr.

↑ Back to Table of Contents

CEMENT MASONS AND CONCRETE FINISHERS

No Rate Established

Duties Include:
Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, or curbs. Align forms for sidewalks, curbs, or gutters.

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 1

Wage	Benefit
$30.76	$14.40

This group includes but is not limited to:
Air Compressor; Auto Fine Grader; Belt Finishing; Boring Machine (Small); Cement Silo; Crane, A-Frame Truck Crane; Crusher Conveyor; DW-10, 15, and 20 Tractor Roller; Farm Tractor; Forklift; Form Grader; Front-End Loader, under 1 cu. yd; Oiler, Herman Nelson Heater; Mucking Machine; Oiler, All Except Cranes/Shovels; Pumpman.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.50/hr.
>60 mi. base pay + $5.50/hr.

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 2

Wage	Benefit
$31.55	$14.10

This group includes but is not limited to:
Air Doctor; Backhoe\Excavator\Shovel, up to and incl. 3 cu. yds; Bit Grinder; Bitunimous Paving Travel Plant; Boring Machine, Large; Broom, Self-Propelled; Concrete Travel Batcher; Concrete Float & Spreader; Concrete Bucket Dispatcher; Concrete Finish Machine; Concrete Conveyor; Distributor; Dozer, Rubber-Tired, Push, & Side Boom; Elevating Grader\Gradall; Field Equipment Serviceman; Front-End Loader, 1 cu. yd up to and incl. 5 cu. yds; Grade Setter; Heavy Duty Drills, All Types; Hoist\Tugger, All; Hydralift Forklifts & Similar; Industrial Locomotive; Motor Patrol (except finish); Mountain Skidder; Oiler, Cranes\Shovels; Pavement Breaker, EMSCO; Power Saw, Self-Propelled; Pugmill; Pumpcrete\Grout Machine; Punch Truck; Roller, other than Asphalt; Roller, Sheepsfoot (Self-Propelled); Roller, 25 tons and over; Ross Carrier; Rotomill, under 6 ft; Trenching Machine; Washing /Screening Plant

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.50/hr.
>60 mi. base pay + $5.50/hr.

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 3

Wage	Benefit
$37.00	$15.93

This group includes but is not limited to:
Asphalt Paving Machine; Asphalt Screed; Backhoe\Excavator\Shovel, over 3 cu. yds; Cableway Highline; Concrete Batch Plant; Concrete Curing Machine; Concrete Pump; Cranes, Creter; Cranes, Electric Overhead; Cranes, 24 tons and under; Curb Machine\Slip Form Paver; Finish Dozer; Front-End Loader, over 5 cu. yds; Mechanic\Welder; Pioneer Dozer; Roller Asphalt (Breakdown & Finish); Rotomill, over 6 ft; Scraper, Single, Twin, or Pulling Belly-Dump; YO-YO Cat Haul Truck, Articulating Trucks, Vac Truck.

Per Diem:
0-75 mi. free zone
>75 mi. $110.00/Day

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

Wage	Benefit
$37.00	$15.93

This group includes but is not limited to:
Asphalt\Hot Plant Operator; Cranes, 25 tons up to and incl. 44 tons; Crusher Operator; Finish Motor Patrol; Finish Scraper.

Per Diem:
0-75 mi. free zone
>75 mi. $110.00/Day

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

Wage	Benefit
$37.00	$15.93

This group includes but is not limited to:
Cranes, 45 tons up to and incl. 74 tons.

Per Diem:
0-75 mi. free zone
>75 mi. $110.00/Day

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 6

Wage	Benefit
$38.00	$15.93

This group includes but is not limited to:
Cranes, 75 tons up to and incl. 149 tons; Cranes, Whirley (All).

Per Diem:
0-75 mi. free zone
>75 mi. $110.00/Day

↑ Back to Table of Contents

CONSTRUCTION EQUIPMENT OPERATORS GROUP 7

Wage	Benefit
$39.00	$15.93

This group includes but is not limited to:
Cranes, 150 tons up to and incl. 250 tons; Cranes, over 250 tons—add $1.00 for every 100 tons over 250 tons; Crane, Tower (All); Crane Stiff-Leg or Derrick; Helicopter Hoist.

Per Diem:
0-75 mi. free zone
>75 mi. $110.00/Day

↑ Back to Table of Contents

CONSTRUCTION LABORERS GROUP 1/FLAG PERSON FOR TRAFFIC CONTROL

Wage	Benefit
$23.08	$11.82

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.05/hr.
>60 mi. base pay + $4.85/hr.

↑ Back to Table of Contents

CONSTRUCTION LABORERS GROUP 2

Wage	Benefit
$26.57	$11.82

This group includes but is not limited to:
General Labor; Asbestos Removal; Burning Bar; Bucket Man; Carpenter Tender; Caisson Worker; Cement Mason Tender; Cement Handler (dry); Chuck Tender; Choker Setter; Concrete Worker; Curb Machine-lay Down; Crusher and Batch Worker; Heater Tender; Fence Erector; Landscape Laborer; Landscaper; Lawn Sprinkler Installer; Pipe Wrapper; Pot Tender; Powderman Tender; Rail and Truck Loaders and Unloaders; Riprapper; Sign Erection; Guardrail and Jersey Rail; Spike Driver; Stake Jumper; Signalman; Tail Hoseman; Tool Checker and Houseman and Traffic Control Worker.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.05/hr.
>60 mi. base pay + $4.85/hr.

↑ Back to Table of Contents

CONSTRUCTION LABORERS GROUP 3

	Wage	Benefit
	$26.07	$11.82

This group includes but is not limited to:
Concrete Vibrator; Dumpman (Grademan); Equipment Handler; Geotextile and Liners; High-Pressure Nozzleman; Jackhammer (Pavement Breaker) Non-Riding Rollers; Pipelayer; Posthole Digger (Power); Power Driven Wheelbarrow; Rigger; Sandblaster; Sod Cutter-Power and Tamper.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.05/hr.
>60 mi. base pay + $4.85/hr.

↑ Back to Table of Contents

CONSTRUCTION LABORERS GROUP 4

	Wage	Benefit
	$26.76	$11.82

This group includes but is not limited to:
Hod Carrier***; Water Well Laborer; Blaster; Wagon Driller; Asphalt Raker; Cutting Torch; Grade Setter; High-Scaler; Power Saws (Faller & Concrete); Powderman; Rock & Core Drill; Track or Truck Mounted Wagon Drill and Welder incl. Air Arc

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $3.05/hr.
>60 mi. base pay + $4.85/hr.

***Hod Carriers will receive the same amount of travel and/or subsistence pay as bricklayers when requested to travel.

↑ Back to Table of Contents

DIVERS

	Wage	Benefit
Stand-By	$48.51	$16.05
Diving	$97.52	$16.05

Depth Pay (Surface Diving)

0-20 ft.	free zone
>20-100 ft.	$2.00 per ft.
>100-150 ft.	$3.00 per ft.
>150-220 ft.	$4.00 per ft.
>220 ft.	$5.00 per ft.

Diving In Enclosures

0-25 ft.	free zone
>25-300 ft.	$1.00 per ft.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $4.00/hr.
>60 mi. base pay + $6.00/hr.

↑ Back to Table of Contents

DIVER TENDERS

Wage	Benefit
$47.55	$16.05

The tender shall receive 2 hours at the straight time pay rate per shift for dressing and/or undressing a Diver when work is done under hyperbaric conditions.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $4.00/hr.
>60 mi. base pay + $6.00/hr.

↑ Back to Table of Contents

ELECTRICIANS

Wage	Benefit
$38.86	$17.75

Travel:
No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

0-18 mi. free zone
>18-60 mi. federal mileage rate/mi.

Per Diem
District 4
>60 mi. $80.00/day
Per Diem in Big Sky and West Yellowstone $125/day.

↑ Back to Table of Contents

INSULATION WORKERS - MECHANICAL (HEAT AND FROST)

Wage	Benefit
$42.26	$21.99

Duties Include:
Insulate pipes, ductwork or other mechanical systems.

Travel:
0-30 mi. free zone
>30-40 mi. $25.00/day
>40-50 mi. $35.00/day
>50-60 mi. $45.00/day
>60 mi. $130.00/day plus

- $0.56/mi. if transportation is not provided.
- $0.20/mi. if in company vehicle.

↑ Back to Table of Contents

IRONWORKERS – REINFORCING IRON AND REBAR WORKERS

Wage	Benefit
$33.95	$24.50

Duties Include:
Structural steel erection; assemble prefabricated metal buildings; cut, bend, tie, and place rebar; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

Travel:
All Districts
0-45 mi. free zone
>45-85 mi. $100.00/day
>85 mi. $150.00/day

↑ Back to Table of Contents

IRONWORKERS – STRUCTURAL IRON AND STEEL WORKERS

Wage	Benefit
$33.95	$24.50

Duties Include:
Structural steel erection; assemble prefabricated metal buildings; cut, bend, tie, and place rebar; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

Travel:
All Districts
0-45 mi. free zone
>45-85 mi. $100.00/day
>85 mi. $150.00/day

LINE CONSTRUCTION – EQUIPMENT OPERATORS

Wage	Benefit
$38.56	$17.93

Duties Include:
All work on substations

Travel:
No Free Zone
$60.00/day

↑ Back to Table of Contents

LINE CONSTRUCTION – GROUNDMAN

Wage	Benefit
$30.11	$17.44

Duties Include:
All work on substations

Travel:
No Free Zone
$60.00/day

↑ Back to Table of Contents

LINE CONSTRUCTION – LINEMAN

Wage	Benefit
$50.35	$19.54

Duties Include:
All work on substations

Travel:
No Free Zone
$60.00/day

↑ Back to Table of Contents

MILLWRIGHTS

Wage	Benefit
$40.49	$18.84

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $4.00/hr.
>60 mi. base pay + $6.00/hr.

↑ Back to Table of Contents

PAINTERS

Wage	Benefit
$25.00	$0.00

Travel and Per Diem:
No travel or per diem established.

↑ Back to Table of Contents

PILE BUCKS

Wage	Benefit
$34.50	$14.07

Duties Include:
Set up crane; set up hammer; weld tips on piles; set leads; insure piles are driven straight with the use of level or plum bob. Give direction to crane operator as to speed, and direction of swing. Cut piles to grade.

Zone Pay:
0-30 mi. free zone
>30-60 mi. base pay + $4.00/hr.
>60 mi. base pay + $6.00/hr.

↑ Back to Table of Contents

PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

Wage	Benefit
$40.06	$20.71

Duties Include:
Assemble, install, alter, and repair pipe-lines or pipe systems that carry water, steam, air, other liquids or gases. Testing of piping systems, commissioning and retro-commissioning. Workers in this occupation may also install heating and cooling equipment and mechanical control systems.

Travel:
District 4
0-70 free zone
>70 mi.

- On jobs when employees do not work consecutive days: $0.55/mi. if employer doesn't provide transportation. Not to exceed two trips.
- On jobs when employees work any number of consecutive days: $110.00/day.

↑ Back to Table of Contents

SPRINKLER FITTERS

Wage	Benefit
$39.06	$25.39

Duties Include:
Duties Include but not limited to any and all fire protection systems: Installation, dismantling, inspection, testing, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems, including both overhead and underground water mains, all piping, fire hydrants, standpipes, air lines, tanks, and pumps used in connection with sprinkler and alarm systems.

Travel

The following travel allowance is applicable when traveling in employee's vehicle.

0-60 mi. free zone
>60-80 mi. $23.00/day
>80-100 mi. $33.00/day
>100 mi. $125.00/day + the IRS rate per mile and $8.92 for every 15 miles traveled for one trip out and one trip back

No travel allowance required when in employer's vehicle except when staying the night.
>100 mi. $125.00/day

↑ Back to Table of Contents

TRUCK DRIVERS

	No Rate Established	
	Wage	**Benefit**
Truck Driver	$31.00	$9.37

Truck drivers include but are not limited to:
Combination Truck and Concrete Mixer and Transit Mixer; Dry Batch Trucks; Distributor Driver; Dumpman; Dump Trucks and similar equipment; Dumpster; Flat Trucks; Lumber Carriers; Lowboys; Pickup; Powder Truck Driver; Power Boom; Serviceman; Service Truck/Fuel Truck/Tireperson; Truck Mechanic; Trucks with Power Equipment; Warehouseman, Partsman, Cardex and Warehouse Expeditor; Water Trucks.

Zone Pay:
All Districts
0-30 mi. free zone
>30-60 mi. base pay + $3.05/hr.
>60 mi. base pay + .$4.85/hr.

Special Provision:
Zone pay only applies to the Truck Driver classification. No zone pay was established for Pilot Car Driver.

↑ Back to Table of Contents

SPECIAL PROVISIONS

FLATHEAD LAKE BIOLOGICAL STATION
REPLACE WASTEWATER SEWER TREATMENT SYSTEM
A/E #2016-01-01-02
SPECIAL PROVISIONS

SP1. CONTRACT DOCUMENTS

The Project Drawings are included as Appendix A to the Project Specifications. The CONTRACTOR will be given two (2) copies of the Contract documents (plans and specifications). One set of Contract documents shall be used by the CONTRACTOR for "As Constructed" drawings. One set of Contract documents shall be the CONTRACTOR's executed copy of the Contract documents.

Additional copies of the Contract documents shall be made available to the CONTRACTOR at a cost of $200 per set. The CONTRACTOR will be required to have a minimum of one set of plans and specifications at the project site at all times during construction. Copies of the Contract documents for bidding are available for purchase from the Engineer, costs are as follows: $200 – Hard Copy, $30 Electronic PDF Copy on USB Drive.

SP2. PREBID EXPLORATION/SITE INFORMATION

All Bidders are strongly encouraged to visit the site of the work and conduct all field investigations at their disposal to become acquainted with the nature of the work. Written authorization shall be obtained from the OWNER, utilities, and others who may be directly affected prior to: entering the property; conduction field tests; drilling, boring, excavating, or test pumping. A pre-bid conference will be held, commencing at 11:00 A.M. at the Flathead Lake Biological at 32125 Bio Station Ln, Polson, MT 59860 on March 6th, 2024. All bidders are encouraged to attend the pre-bid meeting.

SP3. DRAWINGS

The ENGINEER has identified, to the best of his knowledge, all major objects that may influence construction and has indicated them on the Drawings for bidding purposes only. Because of scale, possible additions, subsurface uncertainties, etc., the CONTRACTOR shall be responsible for verifying in the field the exact locations of objects that may influence his construction operations. The ENGINEER and OWNER shall in no way be held responsible for objects not located exactly as shown on the Drawings or for objects installed subsequent to preparation of the Drawings. Locations of water and sewer lines, services and other utilities are approximate and are not intended to be used as exact locations. The CONTRACTOR must obtain assistance from the appropriate entities in locating their respective utilities during construction.

SP4. GEOTECHNICAL INVESTIGATION

Geotechnical investigation work has been done for this Project. **Appendix C** of the contract documents contains the December 2022 *Flathead Bio Statoin Geotechnical Report* by

Pioneer Technical Services. The soil investigations represent only the site conditions at each borehole and the investigations were conducted and should not be considered as a warranty that the conditions exist throughout the site. This data is provided strictly for informational purposes in an effort to provide the contractor with all available information. There is no guarantee that the soil and groundwater conditions portrayed in the study are descriptive of conditions within the general construction area or for any particular time of the year.

SP5. UNSCHEDULED EMPLOYMENT OF THE ENGINEER – LIQUIDATED DAMAGES

Liquidated damages for the unscheduled employment of the ENGINEER and/or Inspector will be assessed against the CONTRACTOR necessitated by the following:

a. The CONTRACTOR working beyond the specified contract time.
b. The CONTRACTOR working more than 8 hours per day, (or 40 hours per week if four ten hour shifts are worked) or on Saturdays, Sundays and federal holidays.
c. The CONTRACTOR utilizing material, supplies, or equipment that requires the redesign of the project.
d. The CONTRACTOR destroying or disturbing baselines, benchmarks or reference stakes.
e. The failure of the CONTRACTOR to maintain acceptable as-built records.
f. Re-submittal review due to the CONTRACTOR not supplying adequate or correct shop drawings, operation and maintenance manuals, and information on the first submittal.

Liquidated damages for the unscheduled employment of the ENGINEER and/or Inspector shall be determined based on the following hourly rates:

Project Manager	$135.00/Hour
Project ENGINEER	$110.00/Hour
Inspector	$100.00/Hour
Mileage	$ 0.65/Mile

Out of pocket expenses for materials, equipment, supplies, transportation, and subsistence shall be billed at cost plus ten percent. Liquidated damages for unscheduled employment of the ENGINEER and/or Inspector shall be deducted from monthly progress payments and the final payment as the damages are incurred.

The CONTRACTOR shall reimburse the OWNER for all costs incurred as a result of the CONTRACTOR's failure to complete the work within the time period specified in the Contract unless modified by a Change in Contract Time. The OWNER shall have one or more representatives observing the work at all times work is taking place. The CONTRACTOR shall reimburse the OWNER for the cost of engineers, architects, attorneys, construction field representatives, and other professionals that are incurred due to the CONTRACTOR's failure to complete the work within the Contract time period.

SP6. SAFETY

The CONTRACTOR shall be responsible for identifying and meeting all safety standards that are applicable to this project. The ENGINEER, the OWNER or any of their representatives or employees do not work in the capacity of overseeing or enforcing safety on the project. The CONTRACTOR shall hold harmless the OWNER and ENGINEER from any claims made as a result of the CONTRACTOR's responsibilities in this regard. Given the institutional nature of the project area, the maintenance of a safe working area will be a priority.

The CONTRACTOR is responsible for providing safe working conditions for all employees, sub-contractors, inspectors, engineers, OWNERS while on site. This includes providing any personal protection equipment being recommended/required by the Centers for Disease Control or the World Health Organization for work completed during the Coronavirus outbreak.

SP7. OFFICE AND TELEPHONE

The CONTRACTOR shall provide the mailing and street address of a local or main office where information related to the project can be delivered or mailed. All communications, drawings, instructions, and other articles will be delivered to the CONTRACTOR's local or main office as appropriate. Communications delivered to either location shall be deemed to have been delivered to the CONTRACTOR. Telephone numbers of the main office and project superintendent shall also be provided.

The CONTRACTOR shall maintain copies of record drawings, specifications, shop drawings, submittals, and all communications pertinent to the performance of the work at the field office and available for use at all times.

The CONTRACTOR will provide a suitable office and restroom facilities as required to support the project and needs of the project superintendent and the contractor's employees. Location of said facilities to be approved by the Engineer and local contact.

SP8. PROJECT RELATED CONTACTS

OWNER: State of Montana
Department of Administration
Contact: Mark Hines
Telephone: 406-444-3331

Local Contact: Eric Anderson
FLBS Maintenance Supervisor
406-250-0911

ENGINEER: Anderson-Montgomery Consulting Engineers, Inc.
1064 N. Warren

Helena, MT 59601
Contact Person: Adam Eckhart, P.E.
Telephone: 406-449-3303

Utilities: One Call Locators
Telephone: 800-424-5555
Note – Some utilities are privately owned on the FLBS Campus

SP9. VERIFICATION OF SIZES AND UNIT QUANTITIES

Sizes, locations and quantities noted in the bid documents are based on survey data, visual observation and other available data. Some changes in quantities may be expected during construction. The contractor will be responsible for documenting the actual quantities used and for ordering the correctly sized materials. Some items are listed in the bid documents to be supplied by the package plant manufacturer, it is the Contractor's responsibility to verify what equipment is being supplied by the package plant manufacturer and what is being supplied by the Contractor. Missed items in the lump sum bid shall not relieve the Contractor from providing the equipment to the Owner at no additional cost.

SP10. BUILDING CODES PERMITS

As required, the CONTRACTOR will be responsible for obtaining Construction Permits from Lake County and Building, Electrical, Mechanical and Plumbing Permits from the Building Codes Bureau, Montana Department of Labor and Industry. The CONTRACTOR shall be responsible for application fees and any costs to implement the permit. The Building Codes contact phone number is (406) 841-2056. As required, the CONTRACTOR will be responsible for obtaining a Lakeshore Construction Permit and a 64A Permit. The Lakeshore Construction Permit is from Lake County and the 64A permit is from the Confederated Salish Kootenai Tribes Shoreline Protection Office. These permits are included in the Appendices for consideration. The Contractor must comply with Confederated Salish and Kootenai Tribes Indian Preference Ordinance Regulations. The Contractor will be responsible for obtaining ALL required permits for completion of the project.

SP11. ASBESTOS INSPECTION

The Lift Station Building demolition work has been inspected by a CERTIFIED asbestos Inspector. All construction materials slated for demolition or renovation at the Lift Station Building were tested and showed no asbestos detected. The Asbestos Test Report is included in **Appendix D**.

SP12. CONSTRUCTION STAKING

The Contractor shall provide construction staking from the Contractor's layouts and the Engineer's control points and coordinates. Contractor's construction staking shall include:

1. Line and grade @ 50' O.C. for piping installation.

2. Establish actual (field verify) piping elevation prior to ordering equipment.
3. Building Centerline and foundation offsets at 10’ o.c.

Prior to commencing work, the Contractor shall carefully compare and check all drawings, each with the other that in any way affects the location or elevation of the work to be executed by him, and should any discrepancy be found, he shall immediately report the same to the Engineer for verification and adjustment. Any duplication of work made necessary by failure or neglect on his part to comply with this function shall be done at Contractor’s sole expense.

SP13. ENGINEERING, INSPECTIONS, AND TESTING

The Contractor’s work will be periodically tested and observed to ensure compliance with the Contract Documents. Complete payment will not be made until the Contractor has demonstrated that the work is complete and has been performed as required. If the Engineer detects a discrepancy between the work and the requirements of the Contract Documents at any time, up to and including final inspection, such work will not be completely paid for until the Contractor has corrected the deficiency.

The Engineer will periodically monitor the construction of work to determine if the work is being performed in accordance with the contract requirements. The Engineer does not have the authority or means to control the Contractor's methods of construction. It is, therefore, the Contractor's responsibility to utilize all methods, equipment, manpower, and other means necessary to assure that the work is installed in compliance with the Drawings and Specifications, and laws and regulations applicable to the work. Any discrepancies noted shall be brought to the Contractor's attention, who shall immediately correct the discrepancy. Failure of the Engineer to detect a discrepancy will not relieve the Contractor of his ultimate responsibility to perform the work as required.

The Contractor shall inspect the work as it is being performed. Any deviation from the Contract requirements shall be immediately corrected. Prior to any scheduled observation by the Engineer, the Contractor shall again inspect the work and certify to the Engineer that he has inspected the work and it meets the requirements of the Contract Documents. All buried work items shall be inspected by the Engineer prior to backfilling, or may not be considered for payment.

The work will be subject to review by the Owner, whose findings shall be as valid as those of the Engineer. The results of all such observations shall be directed to the Contractor through the Engineer.

Testing Services Provided by the Contractor. The Contractor shall provide the following services at no additional cost to the Owner:

a. Any field surveys to establish locations, elevations, and alignments as stipulated on the Plans.

b. Preparation and certification of all required shop drawings and submittals as described in the Supplementary Conditions.

c. Tests as required by the Contract Documents which include, but are not limited to proctors, pressure tests, compaction tests, concrete testing, and leakage testing. All tests requiring the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing laboratory acceptable to the Engineer. The laboratory shall be staffed with experienced technicians properly equipped, and fully qualified to perform the tests in accordance with the specified standards.

d. The Contractor shall provide the Engineer with a written schedule indicating dates for specific testing and inspection services to be performed. The schedule shall be updated as required to give the Engineer at least one week's advance notice. The Contractor shall notify the Engineer immediately of any change or shall be subject to pay engineering fees as herein defined.

e. Maintenance of project record drawings. The project record drawings shall be available for review by the Engineer and Owner at the construction progress meetings.

f. The Contractor shall arrange for and pay for all tests required not specifically identified below as being performed by the Engineer.

Testing Services Provided by the Owner. The Owner shall provide the following services at no cost to the Contractor except as required for retests as defined in the Contract Documents.

a. The Engineer may spot check compaction of backfill, subbase and base course using Proctor information supplied by the Contractor. These tests are only to determine if the material is complying with the Contract Documents. It is the responsibility of the Contractor to ensure that this level of compaction is constant in all locations and provide the services of an independent tester to check compaction and provide results to the Engineer.

SP14. UNDERGROUND AND OVERHEAD UTILITIES

As noted on the Drawings, underground or overhead utilities are present in certain areas of the project. The CONTRACTOR will be required to locate, expose the utilities and/or stake them out of the trench while installing pipelines in these areas or coordinate the lines relocation prior to construction. There is no guarantee as to the accuracy and completeness of such information shown in the Contract documents and all responsibility for the accuracy and completeness thereof is expressly disclaimed. The CONTRACTOR shall be solely responsible for any damage to underground or overhead utilities due to his operations. The

CONTRACTOR shall work closely with the utilities to ensure their criteria are met and no problems result.

All costs associated with construction around, near, under, and/or over underground and overhead utility lines as shown on the contract drawings shall be the responsibility of the CONTRACTOR and included incidental to identified bid payment items. The CONTRACTOR will not be paid specifically for underground utility crossings and parallel underground utilities and the cost of dealing with such shall be included in the total bid amount. The CONTRACTOR will assume full responsibility for any utility conflict cost and repair and to construct within restrictions outlined by the utility company.

All above-ground utilities may not be shown on the plans. It will be the CONTRACTOR's responsibility to field review the magnitude of construction conflict created by the overhead lines and bid this work accordingly. There is no separate pay item for overhead utility conflicts. The CONTRACTOR will need to consider the cost associated with the overhead utilities as a subsidiary cost to the total amount bid.

At least 2 but not more than 10 business days before beginning any excavation, the CONTRACTOR shall according to MCA 69-4-501 notify all owners of underground facilities and coordinate the Work with the owners of such underground facilities. The information shown or indicated in the Contract documents with respect to existing underground facilities is based on information and data obtained from the owners of the facilities without field exploration, and as such, OWNER and ENGINEER are not responsible for the accuracy or completeness of such information or data.

There are some privately owned utilities on the campus, it is the Contractor's responsibility to hire a locator to locate the privately owned utilities. The utilities have been shown on the drawings to the Engineer's best knowledge. The Contractor will assume full responsibility for any utility conflict cost and repair.

SP15. LOCATION OF EXISTING WATER AND SEWER LINES

The location of the existing water and sewer lines in proximity to the new buried utilities is based on old record drawings and a site survey. The CONTRACTOR will be required to locate the existing water and sewer mains through exploratory excavation at no additional cost to the project other than that allowed for exploratory work.

SP16. DEWATERING AND PUMPING OPERATIONS

Installation of the work scheduled under this project may require dewatering operations. **It should be noted that groundwater in the project area generally reflects the level of water in Flathead Lake. Typically lake levels are the lowest in April and begin rising in May.** Dewatering operations shall be adequate to assure the integrity of the finished project. It is the intent of these specifications that such draining, pumping and dewatering, and cleaning operations shall be the obligation of the Contractor. The Contractor shall provide all necessary piping, as required to remove all surface water, groundwater, leakage, and water

from excavations. **No separate pay item is designated for dewatering.** This work will be considered subsidiary to other bid items. Adequate dewatering is defined as the work required to lower the natural groundwater 12" or more below the bottom of excavation in order to get a structurally stable subgrade. If the existing subgrade material is coarse rock and is naturally stable, the 12" depth will not be required. Laying and installing pipe in water will not be allowed.

Any discharge of water during pumping and dewatering operations will be subject to approval of the United States Environmental Protection Agency (EPA). As needed, the CONTRACTOR shall obtain a Construction General Permit and file a Notice of Intent. The Construction General Permit is located at the following web address: https://www.epa.gov/npdes/2022-construction-general-permit-cgp.The Notice of Intent submission information is located at the following web address: https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-lew-under. If necessary, the Contractor may contact the EPA Wastewater Unit for Region 8. The contact for Region 8 is Amy Maybach, her phone number is (303) 312-7014. The Contractor shall be responsible for application fee and any cost to implement the permits. The following web address contains additional resources and tools for the permits: https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates.

The Contractor shall be responsible for any damages caused to surrounding structures, land and physical features in the area. Contractor will restore any ground that had been eroded to its natural state.

Stabilization – Prior to any embankment/backfill work, subgrades shall be firm, dense, and thoroughly compacted and consolidated and shall be sufficiently stable for equipment or manpower to work. Soil material that has been removed because it is too wet to permit compaction may be stockpiled and removed or spread and allowed to dry. Processing of saturated material will not be directly paid for. If the Contractor chooses to import material in lieu of processing wet materials, Contractor will assume responsibility and expense to do such. Authorization for payable import stabilization will only be per direction of Engineer

SP17. WEATHER SHUTDOWN

While it is desired to complete the work as soon as possible, it is recognized that inclement weather may result in a request for a weather shutdown. The OWNER reserves the right to approve or disapprove any shutdown or extension requests. Should a shutdown be granted for unanticipated conditions, the CONTRACTOR shall provide for maintenance of adequate water supply, close all open excavations, provide for maintaining traffic and provide for protection of public property at the work site. The CONTRACTOR will not be allowed to perform any work during the shutdown period unless prior approval is granted by the OWNER.

SP18. WAGE RATES

State of Montana Prevailing Wage Rates shall be utilized on all work. The appropriate wage rates are included in Division 0 of the Contract Documents and shall be applied to this project. Contractor shall comply with all applicable wage laws. The Contractor shall maintain weekly payroll reports and have them available for review by the OWNER or ENGINEER, upon request. All required postings and sample forms will be supplied to the Contractor upon request.

SP19. WARRANTY

The CONTRACTOR shall warranty the project for at least one (1) year against defective materials and defective workmanship according to the General Conditions. The project shall not be accepted as substantially complete until ALL project segments are substantially complete. Only one (1) notice of substantial completion and start of warranty will be issued for this project. Warranty period begins upon final acceptance of project.

An eleven (11) month project inspection will be held for the project one (1) year warranty period. The CONTRACTOR, OWNER and ENGINEER will be invited to attend. At the inspections, warranty items will be defined for correction according to the General Conditions.

SP20. CONTRACTOR EXPERIENCE/PERFORMANCE REQUIREMENTS

The Bidder may be required to demonstrate his ability and capability to meet the requirements herein stipulated to complete the project. Unless specifically stated elsewhere in these specifications, all CONTRACTORs, subcontractors, suppliers and equipment manufacturers shall submit written evidence within five (5) days of OWNER's request, prior to contract award the following:

a. Certification that his/her company(ies) has/have specifically been in the business for products or services which he is bidding.
b. Number of years in business.
c. List of three (3) similar projects completed in the last five (5) years and references for those projects. Similar projects shall include construction of pumphouses or similar structures.
d. Certification of a permanent place of business.
e. Certification and description of adequate plant, staffing and equipment to do the work properly and expeditiously.
f. Certification of suitable financial status to meet obligations incident to the work.
g. Certification of appropriate technical experience.
h. Certification that no just or proper claims are pending against former work performed.

No Bidder will be acceptable if he is engaged on any other work which impairs his ability to finance this contract. These requirements will also apply to all equipment and materials furnished for the project. The OWNER will use these items in determining the lowest responsible bid.

SP21. NOTICES

Except as noted below, the CONTRACTOR shall notify affected users and the OWNER in writing of service outages a minimum of 24 hours in advance of planned outages, including property access. Provide details such as phone number of project superintendent, date, and times for outage.

Notify the ENGINEER and the OWNER a minimum of 48 hours by telephone in advance of any planned utility outage longer than two hours. Any planned outage must be approved in advance by the OWNER or ENGINEER. Notify the ENGINEER 24 hours in advance of intended excavation or other construction activity. Notify the OWNER and ENGINEER as soon as possible of any unplanned outage, even if the outage is corrected immediately.

SP22. REMOVING, REPLACING AND RELOCATING EXTRANEOUS ITEMS

The CONTRACTOR may encounter culverts, fences, signs, ditches, sidewalks, curbs, gutters, barricades, etc. during construction that may hinder his operations. Whether on private or public property, the CONTRACTOR shall, at his own expense, remove, replace, and/or relocate these objects as necessary to conduct his operations. CONTRACTOR shall notify OWNER of such item prior to construction and coordinate with OWNER as to methodology required. Objects removed shall be replaced in as good a condition as previously existed, and to the satisfaction of the ENGINEER.

SP23. RESTORATION OF PROPERTY

All property affected by project construction shall be restored to the preexisting condition found prior to project construction. Damaged turf must be fine graded, topsoiled, seeded and protected against erosion. The technical specification for seeding further describes restoration requirements.

SP24. MATERIAL STORAGE SITES

If necessary, the CONTRACTOR shall secure a storage site for material storage on the campus, location to be at the direction of the Eric Anderson, Maintenance Supervisor for the Flathead Lake Biological Station. Generally, all construction waste materials will be required to be hauled off site to an approved solid waste disposal site.

SP25. PROVISION OF UTILITIES

Water for construction purposes can be provided by the OWNER, generally from hydrants. The Contractor shall be responsible to ensure that water supplies are not contaminated through use or cross connections.

SP26. PROVISION OF WATER OR SEWER SERVICE

Installation of project components and connection to existing mains may require isolation of the existing main and temporary removal of portions of the main from service. **Prior notice**

and approval of water or sewer service shutdown will be required. Generally, service should not be off more than 4 hours, unless absolutely necessary.

SP27. STANDARD SPECIFICATIONS AND DRAWING

Where referenced here and elsewhere in the Contract documents, relevant portions of the Montana Public Works Standard Specifications 6th Edition, April 2010 are adopted by reference and become part of the contract documents. The Montana Public Works Standard Specifications Drawings, 6th Edition, April 2010, are included in these project documents by reference.

SP28. PROJECT SCHEDULE

Contract time for the project will be a total of 110 calendar days beginning August 12th, 2024. Time is of the essence on this project and schedules must be followed to complete construction in a timely manner. Specific project activities must sequentially occur to allow for proper installation and startup of the specified project improvements. Of note, the abandonment of the sanitary sewer, forcemain and existing wastewater treatment facility will need to be coordinated with the startup of the new lift station pumps and new wastewater package plant. The CONTRACTOR must submit a project schedule prior to beginning construction activities on-site with periodic updates as described in Division 1 of the Technical Specifications. **Work between the General Contractor and Specialized Contractors must be coordinated to insure the work is completed in a timely manner. It should be noted that groundwater in the project area generally reflects the level of water in Flathead Lake. Typically lake levels are the lowest in April and begin rising in May. The Flathead Lake Biological Station will be conducting classes July 29th through August 9th with a 125th Annual Celebration on August 2nd. During July 29th through August 9th parking and site presentation are a PRIMARY concern and site preparation (tree removal, grading, etc.) will not be allowed. Approved work in the lift station will be permitted during this time.**

SP29. BID SCHEDULES AND AWARD

The project will be bid in one (1) Base Bid Schedule for completion of the work. No other work will be bid at this time. Award will be based upon available funding and will be decided upon by the Owner in entirety. Award will be based upon the Total Estimated Bid Price for the Base Bid.

SP30. SUBSTITUTIONS FOR SPECIFIED EQUIPMENT

A. The names of equipment and/or materials that are specifically identified herein by manufacturer's names, model, or catalog number are open for substitution after bid opening, but CONTRACTOR must demonstrate "or equal" performance and quality or else requests will be rejected. Manufacturers desiring approval shall submit catalog cuts, which define quality of product and ability to perform as the unit specified.

B. CONTRACTOR shall be responsible for proper selection of proposed substitution and that said substitution is in conformance with the plans and specifications insofar as proper capacities, dimensions, or electrical requirements. Any extra costs to the project as a result of a substitution shall be at the Contractor's Expense.

C. Additional cost associated with the evaluation or incorporation of a proposed substitution necessitating redesign of project components will be the responsibility of the Contractor.

SP31. TRAFFIC PLAN

An approved Traffic Control Plan must be developed outlining procedures to be followed for maintaining typical and emergency traffic throughout the campus and along Bio Station Lane. The plan must be developed and approved prior to initiating work on the project. Appropriate project planning and scheduling should be utilized by the Contractor to keep impacts to the flow of traffic to a minimum. Parking on campus is limited and impacts to available parking will need to be minimized.

SP32. POWER EXTENSION

The Contractor shall provide all trenching, conduit, CT can, meter socket base, and service entrance disconnects. Mission Valley Power shall install the service entrance conductors from the transformer to the building service entrance equipment (located by the transformer), current transformers, and meter. Mission Valley Power shall connect service entrance conductors from the utility transformer to the incoming side of the CT can. The contractor shall connect the service entrance conductors from the outgoing side of the CT can to the main service disconnect and beyond. Coordinate all electrical outages and electrical work with Mission Valley Power.

SP33. ALTERNATE MEMBRANE BIOREACTOR MANUFACTURER

The Contractor/Manufacturer bidding the project with an alternate Membrane Bioreactor (MBR) manufacturer shall be pre-approved by the Engineer ten (10) calendar days prior to the opening of bids. Pre-approval application shall include a written/signed statement from the MBR manufacturer to the Engineer that states that the equipment provided will meet all Montana Department of Environmental Quality (MDEQ) Design Standards or a Deviation Request will be applied for and granted by MDEQ for any shortcomings. Approval from MDEQ will be required prior to Award of the project, if approval is not granted by MDEQ within thirty (30) calendar days from the date of opening bids the bid will be rejected and the next apparent low bidder will be awarded. All financial costs associated with re-design and MDEQ approval will be the responsibility of the Contractor/Manufacturer, the Owner and Engineer **WILL NOT** be responsible for any additional financial costs.

END OF SECTION

TECHNICAL SPECIFICATIONS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.01 PROJECT

A. Project Name: FLBS Replace Sewer Treatment System (A/E #2016-01-01-02)

B. Owner's Name: Flathead Lake Biological Station

C. Project Design Team:

1. Anderson-Montgomery Consulting Engineers, Inc.
   1064 N. Warren St.
   Helena, MT 59601

2. Kingdom Builders Engineering, Inc. (Electrical Engineering)
   P.O. Box 8694 Kalispell, MT 59904
   (406) 212-1624

D. The Project consists of the following major project elements to be conducted at the new wastewater treatment plant site and outfall to the receiving stream in Warm Springs, Montana:

a. Influent/Effluent Lift Station Rehabilitation:

b. Dual solids handling influent pumps with level-sensing and controls;

c. Dual submersible effluent pumps with level-sensing and controls;

d. Magnetic effluent flow meter;

e. Electrical and HVAC;

f. Interior rehabilitation including concrete work, painting, new hatches etc.

2. Membrane Bioreactor Package Plant:

a. Two 10'x40' prefabricated containers;

b. Buried concrete tanks: primary settling tank, equalization tank & sludge holding tank;

c. Primary solids & floatables settling and removal;

d. Pre-anoxic treatment;

e. Aerobic activated sludge treatment;

f. Membrane filtration;

g. Ultra-violet disinfection;

h. Potable water extension to the new package plant;

i. Gravity sewer effluent extension to the new package plant.

3. Site Work:
    a. Potable water extension;
    b. Treated effluent extension;
    c. Asphalt access & parking area;
    d. Concrete sidewalk;
    e. Gravel access road;
    f. Site landscaping/restoration.

1.02 TYPE OF CONTRACT

A. Contract Type: A single prime contract based on a Stipulated Price as described in this Document.

1.03 OWNER OCCUPANCY

A. Cooperate with the Owner to minimize interference with the operation of existing wastewater conveyance/treatment infrastructure due to demolition and construction activities. It is acknowledged that construction progress will generally take precedence. Coordinate with the Owner and their operations at all times.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. The Contractor shall conduct operations and take all necessary precautions to protect staff from exposure to dangers associated with the Work.

B. Provide secure access to and from designated work area as required by law and per the requirements of the Owner, see Special Provisions for additional requirements:
    1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
    2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Existing building spaces may not be used for storage unless specifically authorized by the Owner.

D. Time Restrictions:
    1. Limit conduct of especially noisy and dusty exterior work to the hours of 8 am to 7 pm or as described in Special Provisions.

E. Utility Outages and Shutdown:
    1. Interruption of any utility services must be coordinated through the FLBS Maintenance Director. This coordination is to allow the reasonable use of the existing facilities at all times during normal working hours and interfere minimally with the Owner’s operational activities.
    2. Do not disrupt or shut down utility services without 7 days notice to the FLBS and

authorities having jurisdiction.

3. Prevent accidental disruption of utility services to other facilities.

1.05 WORK SEQUENCE

1. The Contractor will closely coordinate with the Owner and Engineer before conducting any work that impacts existing facilities. Work sequence and schedule shall be described by the Contractor and reviewed by the Engineer.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 11 00

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including general and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 1 Section “Payment Procedures” for administrative requirements.

2. Division 1 Section “Product Requirements” for administrative procedures for handling requests for substitutions made after Contract award.

1.03 VARIATIONS IN WORK

A. Engineer will issue a Field Order authorizing variations in Work, not involving adjustment of the Contract Sum or the Contract Time.

1.04 PROPOSAL REQUESTS

A. Owner-initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Engineer are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within time specified in the Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicated applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include an updated Contractor’s Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Engineer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Engineer will issue a Change Order for signatures of Owner and Contractor.

B. Change Order Form shall be in accordance with the Standard General Conditions Article 7 of these Specifications

1.06 WORK CHANGE DIRECTIVE

A. Work Change Directive: Engineer may issue a Work Change Directive on EJCDC Document C-940 form – see the Standard General Conditions Article 7 of these specifications. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

B. Work change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

C. Documentation: The Contractor shall maintain detailed records on a time and material basis for work required by the Work Change Directive.

D. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)
END OF SECTION 01 26 00

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Format and Preparation of Applications.
2. Schedule of Values
3. Submittal Procedures.
4. Substantiating Data.

B. Related Sections include:

1. General Conditions as provided in Contract Forms section of Contract Documents.
2. Section 01 26 00 – Contract Modification Procedures.
3. Section 01 33 00 – Submittal Procedures.
4. Section 01 77 00 – Closeout Procedures.

1.02 FORMAT AND PREPARATION OF APPLICATIONS

A. Utilize: Periodic Estimate for Partial Payment, Form 101 as provided in Contract Forms section of Contract Documents.

B. Preparation

1. Present required information in typewritten form.
2. Execute certification by signature of authorized officer.
3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
4. List each authorized Change Order as an extension on Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.
5. Prepare Application for Final Payment as specified in Section 01 77 00.

1.03 SCHEDULE OF VALUES

A. Submit:

1. Typed schedule of values in format similar to Periodic Estimate for Partial Payment, Form 101. The schedule of values shall be derived directly from the Bid Items included in the Bid Proposal included in the Project Documents.
2. In duplicate within 15 days after date of Owner-Contractor Agreement.
3. See Article 9.2 of the General Conditions.

B. Format:

1. Utilize a spreadsheet format referencing items in the Bid Proposal, suitable for insertion into the Partial Pay Estimate.
2. Identify line items corresponding with number and title of Specification Section.
3. Provide sufficient information regarding means of measurement of quantities or progress completed for verification by Engineer.

C. Identify site mobilization including bonds and insurance separately. **Payment for Mobilization, Bonds and Insurance is limited to 10% or less of the Total Bid Amount.** Payment for mobilization will be based on the percentage of the original contract amount in place as described in the following schedule:

Percentage of Original Contract Amount In-Place	Percentage of Lump Sum Price for Mobilization Earned
5	20
10	50
25	60
65	75
90	90
100	100

D. Payment: Payment for MOBILIZATON will be made on the percentage of the contract unit price bid per lump sum as indicated in the Bid Form.

1. Include within each line item a direct proportional amount of Contractor's overhead and profit.

E. Revise Schedule of Values to list approved Change Orders, and submit with each Application for Payment.

1.04 PROGRESS PAYMENTS

A. See Article 9 of the General conditions

1.05 SUBMITTAL PROCEDURES

A. Submittals

1. Five (5) copies of each Application for Payment or arrangements for electronic submittal of Payment Application documents can be made.
2. Updated construction schedule with each Application for Payment.
3. Payroll records as required.
4. Payment Periods: As stipulated in the Agreement.
5. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
6. Administrative actions which must precede or coincide with submittal of final application for payment include:

a. Submit lien waivers, warranties and bonds, and project record documents with final application for payment.

b. Completion of all work not included in substantial completion as defined in General and Supplementary Conditions.

c. Completion of project closeout procedures as indicated in Section 01 77 00.

d. Removal of temporary facilities and services.

e. Removal of surplus materials, rubbish, or similar elements.

f. Final cleaning.

g. Transmittal of project construction record documents to Owner and Engineer.

h. Consent of surety for final payment.

1.06 SUBSTANTIATING DATA

A. When Engineer requires substantiating information, submit data justifying dollar amounts in question.

B. Provide one (1) copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

C. Provide copies of invoice(s) for payment of materials stored on-site. Payment will not be made for materials that are not stored on-site or within a bonded warehouse that has been approved by Engineer and Owner.

D. Contractor shall supply substantiating information in compliance with federal and state requirements for monthly utilization reports and weekly prevailing wage and labor rates for laborers on-site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this section.

1.02 SUMMARY

A. This Section specifies administrative provisions for coordination construction operations on Project including, but not limited to, the following:

1. Preconstruction Conference.
2. General project coordination procedures.
3. Conservation.
4. Coordination Drawings.
5. Administrative and supervisory personnel.
6. Project meetings.

B. Related Sections include the following:

1. Division 1 Section 01 70 00 - Execution Requirements - for procedure for coordinating general installation and field-engineering service, including establishment of benchmarks and control points.
2. Division 1 Section 01 77 00 - Closeout Procedures- for coordinating Contract Closeout.
3. Division 1 Section 01 32 00 - Construction Progress Documentation - for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.03 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different specification divisions and sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner, Engineer and separate contractors if coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Installation and removal of temporary facilities and controls.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Preconstruction conferences.
6. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water and minerals.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

a. All materials salvaged in the project shall become the property of the Owner unless otherwise specified. Material identified as salvage shall be delivered by the Contractor to a suitable storage location as directed by the Engineer.

1.04 SUBMITTALS

A. Staff Names: At the preconstruction conference submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office and mobile telephone numbers by which Contractor's representatives can be reached immediately. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of the contact list in temporary field office and by each temporary telephone.

1.05 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.06 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless

otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three days of the meeting.

B. Preconstruction Conference: Engineer and Owner will schedule a preconstruction conference at the Project site or other convenient location. The meeting shall be conducted by the Engineer who shall review work responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and his superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Contractor shall bring a written, detailed construction schedule to the preconstruction conference.
3. Agenda: The Owner, Engineer and Contractor shall discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing.
    d. Designation of responsible personnel.
    e. Subcontractor list.
    f. Testing Responsibilities.
    g. Procedures for processing field decisions and Change Orders.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of Record Documents.
    l. Use of the premises.
    m. Responsibility for temporary facilities and controls.
    n. Office, work, and storage areas.

o. Delivery and storage of materials and equipment.

p. Security.

q. Progress and restoration.

r. Working hours.

s. Specific County regulations.

t. Montana DEQ requirements.

u. Specific FLBS requirements.

C. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meetings. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

i. Interface requirements.

ii. Sequence of operations.

iii. Status of submittals.

iv. Deliveries.

v. Off-site fabrications.

vi. Access.

vii. Site utilization.

viii. Temporary facilities and controls.

ix. Work hours.

x. Hazards and risks.

xi. Progress, restoration and cleanup.

xii. Quality and work standards.

xiii. Change Orders.

xiv. Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

   a. Schedule Updating: As needed revise Contractor's construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including, but not limited to, the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.

B. Related Sections include the following:

1. Division 1 Section 01 29 00 - Payment Procedures - for submitting the Schedule of Values.
2. Division 1 Section 01 31 00 - Project Management & Coordination - for submitting and distributing meeting and conference minutes.
3. Division 1 Section 01 33 00 – Submittals - for submitting schedules and reports.
4. Division 1 Section 01 40 00 - Quality Requirements - for submitting a schedule of tests and inspections.
5. Division 1 Section 01 77 00 – Closeout Procedures - for submitting digital photographic documentation as part of the Project Record Documents at Project closeout.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. Event: The starting or ending point of an activity.

C. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

D. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

E. Milestone: A key or critical point in time for reference or measurement.

F. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.04 SUBMITTALS

A. Qualification Data: For firms and persons specified in Section 01 40 00 – Quality Requirements - to demonstrate their capabilities and experience. Include lists of completed project names and addressed, names and address of Engineers and Owners, and other information specified.

B. Preliminary Construction Schedule: Submit two printed copies: one a single sheet of reproducible media, and one print.

C. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one reproducible print and one a blue-line or black-line print, large enough to show entire schedule for entire construction period.

D. Daily Construction Reports: Submit two copies at monthly intervals.

1.05 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an earlier or later completion date. Contract time can only be authorized through the formal Change Order process. See Section 01 26 00 and Standard General Conditions Article 3.10.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrications, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittals" in schedule. Coordinate submittal review times in contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include time for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.

B. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

C. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final completion.

2.02 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule at the preconstruction conference.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for construction.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE UPDATING

A. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, order, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate actual completion percentage for each activity.

3.02 CONTRACTOR'S CONSTRUCTION SCHEDULE DISTRIBUTION

A. Distribute copies of approved schedule to Engineer, Owner, separate testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submitting shop drawings, Product Data, and other miscellaneous submittals.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

A. General: If needed, electronic copies of CAD Drawings (.dwg) of the Contract Drawings will be provided by Engineer for Seller's use in preparing submittals. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, deliver, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals shall clearly indicate what product is being submitted (highlight, encircle, or otherwise identify) and what specification and section the submittal is applicable to. Each submittal shall contain a single piece of equipment being submitted unless grouping of similar items has been approved by the reviewing engineer.

C. If the Contractor is submitting on an "or equal", it is the Contractor's responsibility to provide documentation showing how the "or equal" item is equal to or better in performance related specifications. This includes but is not limited to providing cut sheets for both items and a written statement clarifying how the "or equal" item is equal to or better in performance.

D. Submittals Schedule: Comply with requirements in Section 01 32 00 - Construction Progress Documentation - for list of submittals and time requirements for scheduled performance of related construction activities.

E. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with Engineer's review of subsequent submittals. Engineer will advise Seller when a submittal being processed must be delayed to permit coordination with subsequent submittals. Engineer will advise Seller when a submittal being processed must be delayed for coordination.
2. Allow 15 days for processing each resubmittal.
3. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit review and processing.

F. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a blank second page to record Prime Contractor's review and approval markings and action taken by Engineer.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Engineer.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Unique identifier, including revision number.
    i. Number and title of appropriate Specification Section.

G. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittal, and *deviations from requirement* of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Provide locations on form for the following information:
    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category and type of submittal.
    g. Submittal purpose and description.
    h. Submittal and transmittal distribution record.
    i. Remarks.
    j. Signature of transmitter.

J. Distribution: Furnish copies of submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

PART 2 - PRODUCTS

2.01 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit four (4) hard copies and one electronic copy (bearing the Contractor's legal signature) of each action submittal, unless otherwise indicated. Engineer will return one electronic copy. Contractor will mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with recognized trade association standards.
    l. Compliance with recognized testing agency standards.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.

l. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 11 by 17 inches unless approved by the Engineer.

D. Coordination Drawings: Comply with requirements in Section 01 31 00 - Project Management and Coordination.

E. Contractor's Construction Schedule: Comply with requirements in Section 01 32 00 - Construction Progress Documentation for Construction Manager's action.

F. Submittals Schedule: Comply with requirements in Section 01 32 00 - Construction Progress Documentation."

G. Application for Payment: Comply with requirements in Section 01 29 00 - Payment Procedures.

H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specifications Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.

2.02 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specifications Sections.

1. Number of Copies: submit two (2) hard copies and one electronic copy of each informational submittal, unless otherwise indicated. Engineer will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Test and Inspection Reports: Comply with requirements in 01 40 00 – Quality Requirements.

B. Contractor's Construction Schedule: Comply with requirements in Section 01 32 00 - Construction Progress Documentation.

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and

addressed, names and addresses of Engineers and Owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product.

K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

M. Maintenance Data: Prepare written and graphic instructions and procedure for operation and normal maintenance of products and equipment. Comply with requirements in Section 01 77 00 - Closeout Procedures.

N. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculation. Include page numbers.

O. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guideline, and procedures for installing or operating a

product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerance.
3. Sequence of installation or erection.
4. Required installation tolerance.
5. Required adjustments.
6. Recommendations for cleaning and protection.

P. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

Q. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance and bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amount of deductibles, if any, and term of the coverage.

R. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Engineer, Engineer will not review this information but will return it with not action taken.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of

reviewer, date of Seller's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ENGINEER'S ACTION

A. General: Engineer will not review submittals that do not bear Seller's approval stamp and will return them without action.

B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicated action taken, as follows:

1. No Exceptions Noted.
2. Exceptions Noted
3. Returned for Correction.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor and/or Equipment Supplier of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Documents requirements.

3. Requirements for Contractor/Supplier to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Section 01 32 00 - Construction Progress Documentation - for developing a schedule of required tests and inspections.

2. Divisions 2 through 16 Technical Sections for specific test and inspection requirements.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.04 SUBMITTALS

A. Qualification Data: For testing agencies specified in Section 01 40 00 - Quality Requirements - to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project,

whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in those types of tests and inspections to be performed.

F. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection and similar quality-assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.06 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency or Engineer to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to the Contractor.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
6. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
7. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

D. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Owner-Provided Temporary Utilities.

B. Contractor-Provided Temporary Utilities.

C. Security requirements.

D. Vehicular access and parking.

E. Waste removal facilities and services.

F. Field offices.

1.02 OWNER PROVIDED TEMPORARY UTILITIES

A. Owner will provide the following:

1. Water supply (from hydrant), consisting of connection to Owner's existing water infrastructure. Any damage due to making or maintaining this connection shall be completely repaired with no cost to the Owner.

2. All provisions needed to protect the Owner's water system are the responsibility of the Contractor, including but not limited to backflow prevention devices. There will be no additional payment for equipment required to protect the Owner's water system.

3. The contractor will be expected to use Owner provided utilities in a conservatively.

B. Contractor shall use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 CONTRACTOR-PROVIDED TEMPORARY UTILITIES

A. Temporary Electrical Services, as required.

B. Telecommunications Services

1. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization, as needed.

C. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

2. Maintain daily in clean and sanitary condition.

D. Barriers

1. Provide barriers to prevent unauthorized entry to demolition areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from

demolition operations.

2. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

E. Fencing – to be provided as directed by the Engineer to maintain security of the construction site.

1.04 SECURITY

A. Coordinate with Owner's security program.

1.05 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic. Coordinate with Construction Manager and MSH on-site representative.

F. Provide temporary parking areas to accommodate Contractor personnel.

1.06 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site at regular intervals.

C. If materials to be recycled or must be stored on-site, provide suitable non-combustible storage areas unless otherwise approved by the authorities having jurisdiction.

1.07 FIELD OFFICES (as needed)

A. Office: Weathertight, with lighting, electrical outlets, heating, ventilating equipment, and equipped with sturdy furniture.

B. Locate offices a minimum distance of 30 feet from existing structures.

1.08 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project: product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include, but are not limited to, the following:

1. Section 01 77 00 - Closeout Procedures - for submitting warranties for contract closeout.

2. Divisions 2 through 46 for specific requirements for warranties on products and installation specified to be warranted.

1.03 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of dated of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are no considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specifications: Where a specific manufacturer's product is named including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorse by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

F. Reference herein to the name "Contractor" will be considered the same as the name "seller".

1.04 SUBMITTALS

A. Substitution Request: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addressed and names and addresses of Engineers and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

i. Cost information, including a proposal of change, if any, in the Contract Sum.

j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.

b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.

B. Basis-of-Design Product Specifications Submittal: Comply with requirements in Division 1 Section "Submittal Procedures" Show compliance with requirements.

C. Contractor will be responsible for any project redesign and/or construction costs that may become necessary as a result of the product substitution.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products to allow for inspection and measurement of quantity or counting of units.

6. Store materials in a manner that will not endanger Project structure.

7. Store products that are subject to damage by the elements, under cover in a watertight enclosure above ground, with ventilation adequate to prevent condensation.

8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

9. Protect stored products from damage.

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Refer to Divisions 2 through 46 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 33 00 – Submittal Procedure and Section 01 77 00 - Closeout Procedures.

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

a. Substitutions may be considered unless otherwise indicated.

2. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

a. Substitutions may be considered, unless otherwise indicated.

2.02 PRODUCT SUBSTITUTIONS

A. Timing: Engineer will consider requests for substitution if received within 30 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Engineer.

B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducing additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

2.03 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents;

2. That it is consistent with the Contract Documents and will produce the indicted results, and that it is compatible with other portions of the Work.

3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

4. Evidence that proposed product provides specified warranty.

5. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
6. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 70 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include, but are not limited to, the following:

1. Section 01 31 00 - Project Management and Coordination - for procedures for coordinating field engineering with other construction activities.
2. Section 01 33 00 - Submittal Procedures - for submitting surveys.
3. Section 01 77 00 - Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.03 SUBMITTALS

A. Qualification Data: As required, land surveyors must demonstrate their capabilities and experience. Include lists of completed projects with project names and addressed, names and addresses of Engineers and Owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Land Surveyor Qualifications; A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services is necessary for all required legal surveys.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocated existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of propose utility interruptions.

2. Do not proceed with utility interruptions without Engineer’s written permission.

C. Field Measurements: Take field measurements as required to locate and execute the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

B. General: As required, engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities in the surveying discipline.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.04 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record

Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do no use tools or equipment that produces harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

G. Hazardous Materials: Use products, cleaners and installation materials that are not considered hazardous.

3.06 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of material lawfully.

1. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended,

use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

F. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortars, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original Condition.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualifications requirements in Division 1 Section "Quality Requirements."

3.08 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

3.09 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction.

1. Repair includes replacing defective parts, refinishing damaged surfaces, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 01 70 00

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Closeout Procedures
2. Substantial Completion
3. Final Completion
4. Certificate of Occupancy
5. Final Cleaning
6. Project Record Documents
7. Spare parts and Maintenance Products
8. Warranties and Bonds
9. Maintenance Service

B. Related Sections include:

1. Section 01 31 00 – Project Management & Coordination.
2. Section 01 50 00 – Temporary Facilities and Controls.
3. Section 01 78 23 – Operation and Maintenance Data.

1.02 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.

B. Provide submittals to Engineer that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy all portions of the Project.

1.03 SUBSTANTIAL COMPLETION

A. Prior to substantial completion Contractor shall review Contract Documents for items which are not complete or need to yet be completed including submittal of all manuals, and testing reports. Contractor shall make a list of incomplete work, a value of the incomplete work, and reasons why work is incomplete. Contractor shall complete all items required to be completed as part of substantial completion.

B. Contractor shall provide a written notice to Engineer that the work, or specific portions of the work, is substantially complete and ready for review. If there are any items remaining

to be corrected or completed Contractor shall submit a list of these items along with the notice of substantial completion. Along with the list of items the Contractor should provide a written explanation of why these items are not considered necessary for substantial completion.

C. Upon receipt of Contractor's notice of substantial completion, Engineer will proceed with inspection for substantial completion.

D. Following the substantial completion inspection by the Engineer and Engineer's subconsultants, Engineer will either prepare certificate of substantial completion, or notify the Contractor in writing that substantial completion has not been met listing the various reasons.

E. Contractor shall promptly complete the items required to meet substantial completion and submit a second notice of substantial completion to the Engineer.

F. Engineer will review the work a second time do determine the status of substantial completion.

G. When Engineer considers the project to be substantially complete, Engineer will prepare the preliminary certificate of substantial completion along with a substantial completion punch list of items to be completed prior to final payment. Engineer will deliver preliminary certificate and punch list to Owner and consider any objections by the Owner as provided in the Conditions of the Contract.

H. Upon agreement by Owner and Engineer of substantial completion and punch list items, Engineer will execute and deliver to the Contractor and Owner a final certificate of substantial completion along with substantial completion punch list of items to be completed prior to final payment.

I. A maximum of two (2) reviews of substantially complete work will be completed by Engineer and Engineer's subconsultants for any one portion of work under the Contract. Should a third or subsequent reviews be necessary the following requirements will be met:

1. Owner will compensate Engineer for additional reviews.
2. Owner will deduct the amount of compensation paid to the Engineer for additional reviews from the payment to the Contractor.
3. Compensation shall be at Engineer's standard hourly rates plus actual cost of reimbursables.

1.04 FINAL COMPLETION

A. Following substantial completion Contractor shall complete remaining work and items to be corrected as part of substantial completion punch list as well as final cleaning and transferring site to Owner.

B. When Contractor considers that all work is complete, Contractor shall provide written notice of final completion to Engineer.

C. Following receipt of final completion certification, Engineer and Engineer's subconsultants shall review the work to verity that the requirements for final completion have been met.

D. Upon review of work for final completion Engineer will either request the Contractor to make closeout submittals or will notify Contractor that the work is not complete with a list of incomplete or defective work.

E. Contractor shall promptly take steps to correct all listed deficiencies and incomplete work before sending a second written notice of final completion certification to Engineer.

F. If final completion was not met following first review, Engineer will review work a second time to determine if the requirements for final completion have been met.

G. A maximum of two (2) reviews of final complete work will be completed by Engineer and Engineer's subconsultants for any one portion of work under the Contract. Should a third or subsequent reviews be necessary the following requirements will be met:

1. Owner will compensate Engineer for additional reviews.
2. Owner will deduct the amount of compensation paid to the Engineer for additional reviews from the payment to the Contractor.
3. Compensation shall be at Engineer's standard hourly rates plus actual cost of reimbursables.

H. When Engineer considers all work to be complete in accordance with the Contract Documents, Engineer shall request the Contractor to make closeout submittals.

1.05 CERTIFICATE OF OCCUPANCY

A. In accordance with State Building Codes, when WORK is complete and ready for occupancy, CONTRACTOR shall contact local building official and request a final building code review for the purposes of obtaining a Certificate of Occupancy for the new Wastewater Treatment Plant.

B. CONTRACTOR shall, in accordance with Supplementary Conditions submit copy of Certificate of Occupancy with final Application for Payment.

1.06 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains, and foreign substances, polish transparent and glossy surfaces, mop all floors.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.07 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling current and future reference by Owner and Engineer.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Provide GPS survey during construction for horizontal and vertical locations of all underground piping and utilities at fittings, valves, building connections, pull boxes, junction boxes, manholes, and other appurtenances.
4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes of dimension and detail.
6. Details not on original Contract drawings.

G. Submit documents to Engineer with claim for final Application for Payment.

1.08 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified in individual

specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.09 WARRANTIES AND BONDS

A. Provide duplicate notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in D size three ring binders with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of components during the warranty period.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

1.11 FINAL ADJUSTMENT OF ACCOUNTS

A. Contractor shall submit a final statement of accounting to Engineer. Statement shall reflect all adjustments to the contract sum and include the following:

1. Original contract sum.
2. Additions and deductions resulting from:
    a. All previous change orders
    b. Allowances
    c. Unit prices
    d. Deductions for uncorrected work
    e. Penalties and bonuses
    f. Deductions for liquidated damages
    g. Deductions for multiple reviews
    h. Other adjustments

3. Total contract sum as adjusted.
4. Previous payments.
5. Sum remaining due.

B. Engineer will prepare a final change order, reflecting approved adjustments to the contract sum which were not previously made by change orders.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 77 00

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Quality Assurance.
2. Format.
3. Contents of Each Volume.
4. Manual for Equipment and Systems.
5. Instruction of Owner's personnel.
6. Submittals.
7. Asset Management Submittals.
8. Schedule of Submittals.

B. Related Sections include:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 40 00 – Quality Requirements.
3. Section 01 77 00 – Closeout Procedures.

1.02 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT

A. Prepare data in the form of an instructional manual. Arrange data in numerical format in accordance with the Specification Divisions.

1. Binders:
    a. Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers.
    b. 2 inch maximum ring size.
    c. When multiple binders are used, correlate data into related consistent groupings.
2. Cover; Identify:
    a. Each binder with typed title OPERATION AND MAINTENANCE INSTRUCTIONS.
    b. Title of Project.
    c. Subject matter of contents.

d. Volume number.

e. Year of construction.

3. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

B. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

C. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages. Folded paper should be un-foldable without removal from binder.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

a. Significant design criteria.

b. List of equipment.

c. Parts list for each component.

d. Operating instructions.

e. Maintenance instructions for equipment and systems.

3. Part 3: Project documents and certificates, including the following:

a. Shop drawings and product data.

b. Materials testing reports (compaction, concrete, pipe leakage, etc.).

c. Certificates.

d. Photocopies of warranties.

e. Bonds.

1.04 CONTENTS OF EACH VOLUME

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Engineer, Subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of

equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties: Prepare and submit per Section 01 77 00.

G. Bonds: Prepare and submit per Section 01 77 00.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed. Refer to applicable Division 16 specification Sections.

C. Include color coded wiring diagrams as installed. Refer to applicable Division 26 specification Sections.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage, and local sources of supply.

N. Additional Requirements: As specified in individual Product specification sections.

O. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

P. Electronic Copies: Compact discs (CD) OR USB drives shall be provided with all manuals in electronic format in a portable document format (*.pdf). The documents shall be placed as required under the appropriate tabs and labels as previously required for the compact disk. Each file shall be adequately labeled to identify the contents without requiring the document to be opened. Additionally, all files shall be named consistently and in a uniform system for cataloguing files.

1.06 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.07 SUBMITTALS

A. Submit electronic copy of preliminary draft or proposed formats and outlines of contents before Substantial Completion. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit electronic copies of completed volumes fifteen (15) working days prior to final inspection. One (1) copy will be returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.

D. Submit four (4) sets of revised final volumes in final form within ten (10) days after final inspection.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

DIVISION 2

EXISTING CONDITIONS, SITEWORK

SECTION 02 41 00
SITE DEMOLITION, DISPOSAL & SALVAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section. *Site demolition will include existing sewerage piping and manholes. The lift station rehabilitation will include demolition of existing pumps, sump pumps, electrical equipment, HVAC, sewerage piping, manual bar screen including basket & electric winch. Please reference drawings LS-1, LS-2 and C-12 for additional demolition information. No buildings are scheduled to be demolished*.

1.02 SUMMARY

A. This Section includes the following (where applicable):

1. Removal and disposal of all construction indicated on the plans or specified in these documents.

2. Removal and disposal of paving, curbing, sidewalks, driveways, crosswalks, utility structures, piping, below grade foundations, improvements to avoid conflict with new construction, disconnection, capping and removal of utilities no longer in use, pollution control during demolition including noise control and removal and legal disposal of materials.

B. Related Sections include the following:

1. Division 1 Section “Payment Procedures" for a schedule of unit prices.

2. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.

3. Division 31 Section “Earthwork” for excavation and embankment, site stripping, grubbing, removing topsoil, and protecting trees to remain.

1.03 SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Engineer for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

C. Coordinate with Owner's continuing occupation of portions of existing building, and with Owner's reduced usage of any portion thereof.

D. Submit project record documents under provisions of Section 01 77 00.

1.04 REGULATORY REQUIREMENTS

A. Conform to all applicable codes for worker safety, confined space entry, dust control, and water and sludge discharges and disposal.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting Work and comply with applicable requirements.

D. Do not close or obstruct roadways except as permitted by Owner. Do not close or obstruct egress width to exits without prior written permission of Owner.

E. Do not disrupt or compromise effectiveness of WWTF operations without written permission of Owner.

F. Conform to procedures applicable if hazardous materials or situations discovered.

1.05 PROJECT CONDITIONS

A. Dust Control: The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the site or building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, and pollution.

B. Protection of Existing Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing facilities and examine the plans and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to ensure against damage to existing facilities to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced as approved by the Engineer at no additional cost to the Owner. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required.

C. Protection of Buildings from the Weather: The interior of buildings and all materials and equipment shall be protected from the weather at all times.

D. Protection of Trees: Trees which might be damaged during demolition and which are indicated to be left in place shall be protected. Any tree designated to remain that is damaged during the Work under this contract shall be replaced.

E. Burning: The use of burning at the project site for the disposal of refuse and debris will not be permitted.

F. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

G. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished.

1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations may occur by Owner's removal and salvage operations prior to start of selective demolition work.

H. Partial Demolition and Removal: Materials of marketable value that are removed in accordance with the provisions of the Project, but that are not to be possessed by the Owner, shall become the property of the Contractor and shall be removed from the right-of-way. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

I. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

1. Confine Work and stockpiling to within Owner’s property or easement as approved by Engineer. Leave undisturbed all street and utility appurtenances not indicated for removal or renovation.

2. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of buildings.

3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of element to be demolished, and adjacent facilities or work to remain.

4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

5. Protect floors with suitable covering when necessary.

6. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs.

8. Maintain, during operation and at completion, pavement removal areas in such condition that they will be well drained at all times.

9. Protect and maintain survey monuments or any construction staking from disturbance during pavement removal.

J. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

K. Explosives: Use of explosives will not be permitted.

L. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

M. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

3.02 PREPARATION

A. Become familiar with required lines of removal and saw cutting.

B. Identify underground utilities.

C. Provide, erect, and maintain adequate barriers and warning lights.

D. Keep streets, sidewalks, and driveways in usable condition; avoid property owner inconvenience insofar as practicable; do not trespass on private property.

E. Verify traffic control in place prior to commencement of pavement removal.

F. Inspect and record existing conditions onsite and at adjacent areas prior to starting construction. Commencement of this Section's Work means acceptance of existing conditions.

3.03 PAVING REMOVAL

A. Saw cutting may be required on concrete and asphalt pavements. Pavement removal beyond the limits established in the notes on the Drawings shall be replaced at the Contractor's expense.

B. Saw cut vertically; remove on straight lines approximately parallel or perpendicular to centerline of pavement.

C. Saw cut vertically full depth to obtain a clean break. After saw cutting, use pneumatic jackhammer or similar device prior to breaking out pavement.

D. Break out remainder of pavement.

E. Disturbances, breakage, or damage to areas not designated for removal shall be restored at Contractor's expense prior to making final payment.

F. Leave underlying sub-base material in a condition suitable for traffic if construction sequence involves delays and if local situation requires access by the public.

G. Pavement removed beyond the limits established shall be replaced to the same specifications as the adjacent removal at Contractor's expense.

3.04 TOLERANCES

A. Saw cut full depth to achieve a clean break.

B. If line of removal falls within 2 feet of an existing joint, adjust line of removal to be the existing joint.

C. Remove entire width of sidewalk if removal width is less than sidewalk width.

3.05 DEMOLITION

A. General: Remove and legally dispose of paving, curbing, sidewalks, driveways, crosswalks, utility structures, piping, below grade foundations, improvements to avoid conflict with new construction, disconnection, and capping and removal of utilities no longer in use.

1. Demolition of existing structures and piping shall only commence after provisions are made to ensure continuing existing utility services.

B. Structures: Existing structures indicated shall be completely removed to two feet below grade. The excavations shall be backfilled and final graded in accordance with other sections of these specifications.

C. Pavement: Cut, remove and dispose of existing pavement to the lines indicated on the plans or as directed by Engineer. Make straight and an approximately vertical cut of edges along which new pavement is to be placed.

D. Driveways and Sidewalks: Remove and dispose of existing concrete

E. Piping: Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the plans, the Engineer shall be notified. Buried piping may be left in place provided that exposed pipe ends are plugged.

1. Pipes shall be plugged with a low slump concrete the entire diameter of the pipe to a minimum depth of 18 inches.

F. Driveways and Sidewalks: Remove and dispose of existing concrete driveways and/or sidewalks which interfere with construction of improvements or which do not match new grade as shown on the contract documents or as directed by Engineer.

1. Remove to a distance of 8 inches behind curbs, or to greater distance if required to properly match the new curb and gutter grade.

2. Saw cut along a neat line to a depth of at least 25 percent of the concrete thickness and take care in removing the concrete assuring the slab breaks on the sawed neat line.

G. Filling: Excavations and other hazardous openings shall be filled in accordance with appropriate sections of these specifications.

3.06 DISPOSAL

A. General: Upon completion of demolition, all debris shall be disposed of in a legal manner, and the site shall be fine graded to the prevailing adjacent grades and contours.

3.07 SALVAGE

A. Title to Materials: Title to all materials and equipment to be demolished, excepting Owner salvage and historical items, is vested in the Contractor upon receipt of Notice to Proceed. The Owner will not be responsible for the condition, loss or damage to such property after Notice to Proceed.

B. Material for Contractor Salvage: Material for salvage shall be stored as approved by the Engineer. Salvage materials shall be removed from Owner's property before completion of the contract. Material for salvage shall not be sold on the site. Salvage material may not be reused in the project without written approval of the Engineer.

C. Unsalvageable Materials: Materials, other than those permitted to remain in place, shall be disposed of in a legal manner. On-site disposal will not be allowed.

END OF SECTION 02 41 00

DIVISION 3

CONCRETE & GROUT

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

B. Related Requirements:

1. Section 03 20 00 "Concrete Reinforcing" for reinforcement related to concrete pavement and walks.
2. Section 03 30 00 "Cast-In Place Concrete" for formwork related to concrete pavement and walks

1.03 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:
    a. Special inspection and testing and inspecting agency procedures for field quality control.
    b. Construction, movement, contraction, and isolation joints
    c. Forms and form-removal limitations.
    d. Shoring and reshoring procedures.
    e. Anchor rod and anchorage device installation tolerances.

1.05 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.

3. Void forms.
4. Form ties.
5. Waterstops.
6. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301 and ACI 350.5 when not indicated in Drawings.
    a. Location of construction joints is subject to approval of the Engineer.
3. Indicate location of waterstops.
4. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Waterstops, Joint Fillers, Joint Sealers, Backing Rods, and Bond Breaker:

1. Certified mill certificates showing that the material meets all of the requirements specified here-in. The Engineer, at their option, may take samples of any materials and have them tested by an independent testing laboratory to verify their compliance with these Specifications. All such costs shall be borne by the Owner. If any materials should fail to meet these Specifications, all costs for further testing of the replacement materials shall be borne by the Contractor.

C. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.09 OBSTRUCTIONS

A. Contractor shall pay particular attention to removing all obstructions such as concrete, nails, etc., from joints when movements of floor, wall and roof sections can be expected under temperature or other conditions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301 and ACI 350.5, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
3. Forms for circular structures shall conform to the circular shape of the structure.
4. Do not use earth cuts as forms for vertical or sloping surfaces unless required or permitted in drawings.
5. Formwork shall be essentially watertight and shall prevent loss of mortar from concrete. Seal all joints or gaps with an acceptable material.

2.02 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
    a. Plywood, metal, or other approved panel materials.
    b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
        1) APA HDO (high-density overlay).
        2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
        3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
        4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
    c. Do not use form-facing materials with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of concrete surfaces.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.03 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals, with factory fabricated corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. JP Specialties, Inc.

b. Sika Corporation.

2. Profile: Ribbed without center bulb.

3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

B. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, for embedding in concrete to prevent passage of fluids through joints, with factory fabricated corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Sika Corporation.

b. Or approved equal.

2. Profile: As indicated.

3. Dimensions: As indicated; nontapered.

C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Products: Subject to compliance with requirements, provide the following:

a. Sika Corporation.

b. Or approved equal.

2.04 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Chamfer Strips: Smooth wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

C. Rustication Strips: Smooth wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2. Form release agent for form liners shall be acceptable to form liner manufacturer.

E. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1-1/2 inch to the plane of exposed concrete surface.

2. Furnish ties that, when removed, leave holes at least 1 inch in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls.

PART 3 - EXECUTION

3.01 INSTALLATION OF FORMWORK

A. Comply with ACI 301 and ACI 350.5.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Environmental Surface Finish-1.0 (ESF-1.0): 1 inch

a. No formwork facing material is specified

b. Patch voids greater than 1-1/2 in. wide or 1/4 in. deep

c. Remove projections greater than 1/2 in.

d. Tie holes needed to be patched

e. Surface tolerance Class C (ACI 117)

f. Leave surfaces with the texture imparted by the forms

g. Mockup not required

2. Environmental Surface Finish-2.0 (EFS-2.0): 1/4 inch

a. Patch voids greater than 3/4 in. wide or 1/4 in.

b. Remove projections greater than 1/4 in.

c. Patch tie holes

d. Surface tolerance Class B (ACI 117)

e. Mockup not required

3. Environmental Surface Finish-3.0 (ESF-3.0): 1/8 inch

a. Patch voids greater than 3/4 in. wide or 1/4" deep

b. Remove projections greater than 1/8 in.

c. Patch tie holes

d. Surface tolerance Class A (ACI 117)

e. Provide mockup of concrete surface appearance and texture

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.

2. Exposed Concrete: Symmetrically align joints in forms.

a. For ESF 3.0 surfaces, set the facing materials in an orderly and symmetrical arrangement, and keep the number of seams to a practical minimum. Facing materials shall be supported with studs or other backing capable of maintaining deflection with the tolerances specified in Part 1. Fit adjacent panels with tight joints.

3. Taper form ties shall be placed with the larger end on the side of the structure that will be in contact with liquid.

a. Seal tie holes in formwork to prevent leakage where ties penetrate the formwork.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips

2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.

2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.

2. Obtain written approval of Engineer prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.

2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

3. Place joints perpendicular to main reinforcement.

4. Locate joints for beams and slabs in the middle third of spans, unless indicated otherwise in plans.

5. Locate horizontal joints in walls at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

6. Space vertical joints in walls as indicated on Drawings.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.

2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

4. Clean embedded items immediately prior to concrete placement.

5. Fill voids in inserts to prevent entry of concrete.

6. Coat surfaces of aluminum embedments to prevent reaction with the concrete.

3.03 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.

2. Locate waterstops in center of joint unless otherwise indicated on Drawings.

3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 03 30 00 "Cast-In-Place Concrete."

4. Secure waterstops in correct position at 12 inches on center in such a manner that bending over one way or another is prevented.

a. Vertical waterstops shall be anchored back to the reinforcement with wire ties or by other acceptable means.

b. For flexible waterstops placed horizontally, the waterstop shall be folded upward along its entire length while concrete is placed and consolidated up to the level of the waterstop, and then the waterstop shall be pressed into the top of of the fresh concrete. Then complete concrete placement and consolidation so as to provide full encasement of the water stop in concrete.

5. Waterstops at vertical joints shall terminate 3 in. below the tops of exposed walls.

6. Field fabricate joints in accordance with manufacturer's instructions using heat welding.

a. Miter corners, intersections, and directional changes in waterstops.

b. Align center bulbs.

c. Splices shall be strong enough to develop a pulling force of 75 percent of the strength of the waterstop, and shall be watertight.

7. Clean waterstops immediately prior to placement of concrete.

8. Waterstops with a center bulb shall have the ends of the center bulb plugged with a flexible material, such as foam rubber, to prevent concrete intrusion at ends where the bulb will be exposed to concrete extrusions.

9. Support and protect exposed waterstops during progress of the Work.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.

2. Locate waterstops in center of joint unless otherwise indicated on Drawings.

3. Protect exposed waterstops during progress of the Work.

3.04 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70% of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.

2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.

2. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.05 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 350 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.06 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed, and for compliance within tolerances specified in ACI 117.

2. Waterstops:

a. It is required that all waterstop field joints shall be subject to rigid inspection, and no such work shall be scheduled or started without having made prior arrangements with the ENGINEER to provide for the required inspections. Not less than 24 hours' notice shall be provided to the ENGINEER for scheduling such inspections. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the CONTRACTOR at its own expense.

b. The following waterstop defects represent a partial list of defects which shall be grounds for rejection.

1) Offsets at joints greater than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

2) Exterior crack at joint, due to incomplete bond, which is deeper than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

3) Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15 percent of material thickness at any point, whichever is less.

4) Misalignment of joint which result in misalignment of the waterstop in excess of ½-inch in 10 feet.

5) Porosity in the welded joint as evidenced by visual inspection.

6) Bubbles or inadequate bonding which can be detected with a pen knife test. (If, while prodding the entire joint with the point of a pen

knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.)

3. Waterstop Samples:

   a. Field samples of fabricated fittings (crosses, tees, etc.) may be selected at random by the ENGINEER at their discretion, for testing by a laboratory at the OWNER'S expense. When tested, they shall have a tensile strength across the joints equal to at least 75 percent of the manufacturer's reported tensile strength of the product. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this contract.

END OF SECTION 03 10 00

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 03 30 00 "Cast-In-Place Concrete" for reinforcing used in cast-in-place concrete.
2. Section 03 41 00 "Precast Structural Concrete" for reinforcing used in precast structural concrete.
3. Section 32 13 13 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:
    a. Special inspection and testing and inspecting agency procedures for field quality control.
    b. Construction contraction and isolation joints.
    c. Steel-reinforcement installation.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
    a. Include a written description of where each bar support will be used.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.

2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure where not indicated in Drawings.

1. Location of construction joints is subject to approval of the Engineer.

1.05 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

B. Material Certificates:

1. Mill test certificates shall be submitted to the Engineer to certify that the reinforcing steel meets the specified requirements. Mill test certificates shall be furnished and paid for by the Contractor.

2. In addition, the Engineer may require that test samples be taken and test certificates be furnished by a reputable material testing laboratory at the Owner's expense.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

D. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth, oil, or other materials that may decrease bond to concrete.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed. Grade 40 steel shall be allowed for #3 and smaller bars.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

D. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.

E. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

F. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.02 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from stainless steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice" and ACI 315, and as follows:

a. Where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

1) For plastic protected wire, plastic shall have a thickness of 3/32 inches or greater at points of contact with formwork and the plastic shall extend along the wire at least 1/2 inches from the point of contact with the formwork.

2) For stainless steel protected wire-reinforcement supports, the non-stainless steel portion of the supports shall not extend closer than 3/4 inches from the form surface.

b. Precast concrete (adobes) shall, as a minimum, be no less in compressive strength or cement content than the concrete in which it will be cast, and a surface area of not less than 4 square inches. Water absorption and porosity of precast concrete supports shall be equal to or less than water absorption and porosity of concrete being placed. Adobes manufactured from plastic or with low cement contents will not be accepted. Brick, broken concrete masonry units, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

c. All-plastic reinforcement supports shall incorporate perforations in plane areas to compensate for the difference in the coefficient of thermal expansion between the plastic and concrete.

C. Mechanical Splice Couplers: ACI 318 Type 2, same material of reinforcing bar being spliced; tension-compression type.

1. Products: Subject to compliance with requirements, available products by one of the following:

a. Dayton Superior.

b. Or approved equal.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.03 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice," and in accordance with fabricating tolerances of ACI 117.

B. Bend reinforcement cold unless heating is approved by the Engineer prior to fabrication.

C. Minimum inside bend diameters shall conform to the requirements of ACI 350.5 unless otherwise permitted. The beginning of the bend shall not be closer to the concrete surface than the minimum diameter of the bend.

D. Kinked bars shall not be used.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.

2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.02 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

2. The supports shall be of sufficient quantity, strength and stability to maintain the reinforcement in place throughout the concreting operations. Bar supports shall be placed no further than 4 feet apart in each direction.

3. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 350.

1. Placing tolerances shall not reduce cover requirements except as specified in ACI 117.

2. No "bury" or "carrier" bars will be allowed unless specifically approved by the Engineer.

E. Reinforcing Tying:

1. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

2. There shall be at least three ties in each bar length (this shall not apply to dowel laps or to bars shorter than 4 feet, unless necessary for rigidity).

3. Slab bars shall be tied at every intersection around the periphery of the slab. Wall bars and slab bar intersections shall be tied at not less than every second intersection, but at not greater than the following maximum spacings:

a. Slab Bars: Bars No. 5 and smaller = 30 inches; Bars No. 6 through No. 9 = 48 inches; Bars Bars No. 10 through No. 11 = 60 inches

b. Wall Bars: Bars No. 5 and smaller = 24 inches; Bars No. 6 through No. 9 = 30 inches; Bars No. 10 through No.11 = 48 inches.

F. Reinforcing partially embedded in concrete shall not be field bent unless indicated on the Drawings.

G. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.

2. Stagger splices in accordance with ACI 350.

3. Lapped spliced bars shall be fastened together with steel tie wire.

4. Unless specified or shown otherwise on the Drawings, the bars at a lap splice shall be in contact with each other.

5. Unless shown otherwise on the Drawings, where bars are to be lapped spliced at joints in the concrete, all bars shall project from the concrete first placed, a minimum length equal to the lap splice length indicated on the Drawings. All concrete or other deleterious coating shall be removed from dowels and other

projecting bars by wire brushing or sandblasting before the bars are embedded in a subsequent concrete placement.

6. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
    a. Mechanical splices for reinforcement not shown on the Project Drawings shall not be used unless accepted by the Engineer.
7. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

H. When there is a delay in depositing concrete, reinforcement shall be re-inspected and cleaned when necessary.

I. Reinforcement relocation - When necessary to move reinforcement beyond the specified placing tolerances to avoid interference with other reinforcement, conduits, or embedded items, submit the resulting arrangement of reinforcement for acceptance by the Engineer.

J. Install welded-wire reinforcement in longest practicable lengths.
1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.
5. The welded wire fabric shall be bent as shown or required on the Drawings to fit the work. Welded wire fabric shall be rolled or otherwise straightened to make a perfectly flat sheet before placing in the Work.

3.03 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.04 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.
2. Reinforcing support type, spacing, and quantity of reinforcing supports.
3. Steel-reinforcement mechanical splice couplers.
4. Steel-reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 03 20 00 – Concrete Reinforcing

C. Section 03 10 00 – Concrete Forming and Accessories

1.02 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete Subcontractor.

e. Special concrete finish Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.

b. Construction joints, control joints, isolation joints, and joint-filler strips.

c. Semirigid joint fillers.

d. Vapor-retarder installation.

e. Anchor rod and anchorage device installation tolerances.

f. Cold and hot weather concreting procedures.

g. Concrete finishes and finishing.

h. Curing procedures.

i. Forms and form-removal limitations.

j. Shoring and reshoring procedures.

k. Methods for achieving specified floor and slab flatness and levelness.

l. Floor and slab flatness and levelness measurements.

m. Concrete repair procedures.

n. Concrete protection.

o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)

p. Protection of field cured field test cylinders.

1.05 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement;
4. Silica fume;
5. Aggregates.
    a. Include types, pit or quarry locations, producers' names, gradations, specific gravities, and evidence of not more than 90 days old demonstrating compliance with product specifications.
6. Admixtures:
    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Bonding agents;
8. Color pigments.
9. Fiber reinforcement.
10. Vapor retarders.
11. Floor and slab treatments.
12. Liquid floor treatments.
13. Curing materials.

a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

14. Joint fillers.
15. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    a. Location of construction joints is subject to approval of the Engineer.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.

5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
   1. Installer: Include copies of applicable ACI certificates.
   2. Ready-mixed concrete manufacturer.
   3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Fiber reinforcement.
   4. Curing compounds.
   5. Floor and slab treatments.
   6. Bonding agents.
   7. Adhesives.
   8. Vapor retarders.
   9. Semirigid joint filler.
   10. Joint-filler strips.
   11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:
   1. Portland cement.
   2. Fly ash.
   3. Slag cement;
   4. Silica fume;
   5. Aggregates;
   6. Admixtures:
      a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Research Reports:
   1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
   2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.

b. Slump.

c. Air content.

d. Seven-day compressive strength.

e. 28-day compressive strength.

f. Permeability.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 350.5

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 350.5 and ACI 306.1, including but not limited to the following:

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. When average high and low temperature is expected to fall below 40° F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 350.5;

3. Do not use frozen materials or materials containing ice or snow.

4. Do not place concrete in contact with surfaces less than 35° F, other than reinforcing steel.

5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 350.5 and ACI 306.1, including but not limited to the following:

1. Keep concrete subgrade uniformly moist without standing water, soft spots or dry areas;

2. Maintain concrete temperature at time of discharge to not exceed 95° F;

3. Use a concrete consistency that permits rapid placement with least delay;

4. Protect the concrete against moisture loss at all times during placing and curing;

5. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.

C. There will not be any additional reimbursement made to the Contractor for costs incurred for placing concrete in cold or hot weather.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 350.5 unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.

2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.

3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, for cast-in-place structural concrete. The December 2022 Flathead Bio Station Geotechnical Report recommends the use of "Type I/II cements for all cast-in-place structural concrete exposed to the native soils".
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120
4. Silica Fume: ASTM C1240 amorphous silica

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb/yd3 for moderately reactive aggregate or 3 lb/yd3 for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size: ¾ inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

7. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.

8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).

    a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi or 14 days.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.03 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Corporation;

    b. Dayton Superior;

    c. Euclid Chemical Company;

    d. W.R. Meadows, Inc.;

    e. SealantPro

B. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.

2.04 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Corporation;

b. Dayton Superior;

c. Euclid Chemical Company;

d. W.R. Meadows, Inc.;

e. Sika Corporation

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./yd2 when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50° F: Black.

b. Ambient Temperature between 50° F and 85° F: Any color.

c. Ambient Temperature Above 85° F: White.

D. Curing Paper: 8' wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

E. Water: Potable or complying with ASTM C1602/C1602M.

F. Clear, solvent-borne, membrane-forming, curing and sealing compound: ASTM C1315, Type 1, Class A

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not necessarily limited to, the following:

a. BASF Corporation; MasterKure CC 250 XS

b. Dayton Superior; Cure & Seal 25% J22UV

c. Euclid Chemical Company (The); an RPM company; Luster Seal 300

d. Laticrete International, Inc.; L&M Lumiseal Plus

e. W.R. Meadows, Inc; CS-309-30.

f. Lambert Corporation; UV Super Seal

2.05 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.06 RELATED MATERIALS

A. Joint Sealers: two-part, self-leveling, uniform, stiff consistency, non-staining, polyurethane elastomeric sealant which cures at ambient temperature, conforming to ASTM C-920 and does not contain solvents.

1. The material shall be of a type that will effectively and permanently seal joints subject to movements in concrete.

2. The mastic shall tenaciously adhere to primed concrete surfaces, shall remain

permanently mastic and shall be NSF approved for use with potable water.

3. For sloping joints, vertical joints and overhead horizontal joints, only “non-sag” compounds shall be used; all such compounds shall conform to the requirements of ANSI/ASTM C 920 Class 12-1/2
4. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C 920 Class 25. For joints subject to either pedestrian or vehicular traffic, a compound providing non-tracking characteristics, and having a Shore “A” hardness range of 25 to 35, shall be used.
5. Primer materials, if recommended by the sealant manufacturer, shall conform to the printed recommendations of the sealant manufacturer.
6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. PERMAPOL RC-270SL RESERVOIR SEALANT, as manufactured by PRODUCTS RESEARCH & CHEMICAL CORP., Gloucester City, New Jersey (800-257-8454)
    b. SIKAFLEX/2C POLYURETHANE ELASTOMERIC SEALANT, as manufactured by SIKA CHEMICAL CORP., Santa Fe Springs, CA (213-941-0231)
    c. SELECT SEAL U-227 RESERVOIR GRADE, as manufactured by SPC, Upland, CA (7l4-985- 577l)
    d. Or approved equal.

B. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

C. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

D. Backing Rod: Backing rod shall be an extruded closed cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width except that a one-inch diameter rod shall be used for a 3/4-inch wide joint.

E. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

G. Bond Breaker: Bond breaker shall be SUPER BOND BREAKER WATER BASE as

manufactured by Burke Company, San Mateo, California; SELECT EMULSION CURE 309, as distributed by Select Products Co., Upland, CA (clear or white pigmented) or equivalent. Fugitive dye may be used in bond breakers if recommended by the manufacturer.

H. Floor Slab Protective Covering: 8' wide cellulose fabric.

2.07 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from ⅛" and that can be feathered at edges to match adjacent surface elevations/profiles.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel: ⅛" to ¼", or coarse sand, as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4,500 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from ¼" and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, ⅛" to ¼", or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.08 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 350.5.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.

2. Slag Cement: 50 percent by mass.

3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
1. Use water reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in and concrete with a w/cm below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

D. Color Pigment: Add color pigment (if called for in project documents) to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.09 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings.
1. Exposure Class: ACI 318 F1, S2, W0, C0.
2. Minimum Compressive Strength: 3500 psi at 28 days.
3. Maximum w/cm: 0.55.
4. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:
a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

B. Class B: Normal-weight concrete used for grade beams and non-fluid retaining foundation walls.
1. Exposure Class: ACI 318 F2, S2, W0, C0
2. Minimum Compressive Strength: 4500 psi at 28 days.

3. Maximum w/cm: 0.50.
4. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches, plus or minus 1 inch, before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:
    a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slab-on-grade, fluid-retaining slabs and walls and roof slabs over fluid-containing tanks.
1. Exposure Class: ACI 318 F2, S2, W1, C2.
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.42
4. Minimum Cementitious Materials Content: 560 lb/cu. yd.
    a. Provide Portland Cement - Type V combined with a minimum of 20 percent, by weight, of cementitious material with either of the following:
    b. Fly Ash supplemented with Silica Fume, or
    c. Ground-Granulated Blast-Furnace Slag supplemented with Silica Fume.
5. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches, plus or minus 1 inch, before adding high-range water-reducing admixture or plasticizing admixture at Project site.
6. Air Content:
    a. Exposure Classes F2 and F3: 6 percent, plus or minus, 1.5 percent measured at the point of delivery for concrete containing 3/4-inch nominal maximum size aggregate;
    b. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.

D. Class D: Normal-weight concrete used for interior slabs-on-grade, topping for metal decks, sidewalks, driveways, and equipment bases.
1. Exposure Class: ACI 318 F0, S0, W0, C0.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.

4. Minimum Cementitious Materials Content: 540 lb/cu. yd.
5. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
6. Air Content:
    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

E. Class F: Controlled Low Strength Material (CLSM) for flowable backfill.
    1. Design and produce non-excavatable CLSM in accordance with the following requirements:
        a. Unconfined compressive strength greater than 150 psi determined by ASTM D4832.
        b. Air Content between 5% and 30% determined by ASTM D6023.
        c. Unit weight of 100-130 lbs/cu. ft. determined by ASTM D6023.
        d. Consistent flow producing a self-leveling product free of segregation determined by ASTM D6103.
        e. Do not use materials in CLSM with a plasticity index over 4.
        f. Furnish aggregates in accordance with the following gradation:
            i. 3/4-inch sieve: 100 percent passing
            ii. No. 4 sieve: 65- 100 percent passing
            iii. No. 30 sieve: 40 - 80 percent passing
            iv. No. 200 sieve: 10 - 30 percent passing.

F. Class H: Normal-weight concrete used for building walls not exposed to H2S or immersion.
    1. Exposure Class: ACI 318 F2.
    2. Minimum Compressive Strength: 5000 psi at 28 days.
    3. Maximum w/cm: 0.45.
    4. Slump Limit: 8 inches plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
    5. Air Content:
        a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

G. Class I: Grout used for Grout Shaping of flumes, wet wells, etc.

1. Exposure Class: ACI 318 F0, S2, W1
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content:
    a. Exposure Class F0: None required.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.04 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.

2. Face laps away from exposed direction of concrete pour.

3. Lap vapor retarder over footings and grade beams not less than 6 inches sealing vapor retarder to concrete.

4. Lap joints 6 inches and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.

6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.

7. Protect vapor retarder during placement of reinforcement and concrete.

a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.05 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Engineer.

2. Place joints perpendicular to main reinforcement.

a. Continue reinforcement across construction joints unless otherwise indicated.

b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 350 but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 350.5.
    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked

around reinforcement and other embedded items and into corners.

3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.07 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 350 Environmental Surface Finish ESF-1.0: As-cast concrete texture imparted by form-facing material.
    a. Apply to concrete surfaces not exposed to view for non-fluid-retaining elements.
2. ACI 350 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces exposed to public view.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:
    a. Perform no later than one day after form removal.
    b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
    d. Maintain required patterns or variances as shown on Drawings or to match mockups.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent

formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.08 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.

2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.

3. Apply scratch finish to surfaces to receive grout shaping.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.

3. Apply float finish to surfaces to receive trowel finish and fluid-retaining slabs.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.

2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

4. Do not add water to concrete surface.

5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.

6. Apply a trowel finish to surfaces exposed to view .

7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

a. Slabs on Ground:

i. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots

and placed anywhere on the surface does not exceed 1/4 inch.

b. Suspended Slabs:

i. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Engineer before application.

2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

2. Coordinate required final finish with Engineer before application.

3.09 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.

2. Mix, place, and cure concrete, as specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.

3. Minimum Compressive Strength: 4000 psi at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

5. Prior to pouring concrete, place and secure anchorage devices.

a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

b. Cast anchor-bolt insert into bases.

c. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Aluminum Inserts and Embeds. All aluminum materials inserted in concrete shall have the contact surface coated with bitumastic.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 350.5 and ACI 306.1 for cold weather protection during curing.

2. Comply with ACI 350.5 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

2. Curing period shall not be less than seven days.

3. If forms remain during curing period, moist cure after loosening forms.

4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

b. Continuous Sprinkling: Maintain concrete surface continuously wet.

c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

i. Method by itself is not permitted for fluid-retaining structures.

e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions. This method is not permitted for fluid-retaining structures.

i. Recoat areas subject to heavy rainfall within three hours after initial application.

ii. Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors for non- fluid retaining slabs:
    a. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
        i. Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            - Lap edges and ends of absorptive cover not less than 12 inches.
            - Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
        ii. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
            - Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            - Cure for not less than seven days.
        iii. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
            - Water.
            - Continuous water-fog spray.
    b. Floors to Receive Curing Compound:
        i. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
        ii. Recoat areas subjected to heavy rainfall within three hours after initial application.
        iii. Maintain continuity of coating, and repair damage during curing period.
        iv. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
    c. Floors to Receive Curing and Sealing Compound:
        i. Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.

ii. Recoat areas subjected to heavy rainfall within three hours after initial application.

iii. Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3. Slabs for fluid-retaining structures:

a. Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire are of floor.

i. Lap edges and ends of absorptive cover not less than 12 inches.

ii. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

b. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

i. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

ii. Cure for not less than seven days.

c. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

i. Water.

ii. Continuous water-fog spray.

3.11 TOLERANCES

A. Conform to ACI 117

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than 14 days' old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.

4. Rinse with water; remove excess material until surface is dry.

5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound

to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Install cork type joint filler in joints in fluid-retaining elements.

2. Defer joint filling until concrete has aged at least six month(s).

3. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 JOINT SEALING

A. Joints, not requiring waterstops or when so indicated on the Drawings, shall be sealed.

B. Joint sealed areas shall be sandblasted or roughened and blown clean of dust and sand with compressed air before the material may be applied.

C. Joints shall be primed (if required) and the sealant shall be applied in accordance with the manufacturer's recommendations.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Engineer.

2. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repair cracks in liquid containing concrete structures with widths greater than 0.010 inches, unless otherwise specified or directed by the Engineer.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing. Mix the repair mortar and turn the mortar frequently with a trowel without adding water.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch

b. Make edges of cuts perpendicular to concrete surface.

c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.

d. Fill and compact with patching mortar before bonding agent has dried.

e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Engineer.

E. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

a. Correct low and high areas.

b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

3. After concrete has cured at least 14 days, correct high areas by grinding.

4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.

b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.

   b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

   c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.

   d. Place, compact, and finish to blend with adjacent finished concrete.

   e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.

   b. Dampen cleaned concrete surfaces and apply bonding agent.

   c. Place patching mortar before bonding agent has dried.

   d. Compact patching mortar and finish to match adjacent concrete.

   e. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 WATER HOLDING STRUCTURES LEAKAGE TESTING

A. Complete in accordance with ACI 350.1.

B. All concrete structures that are designed to hold or pass water shall be hydraulically tested after curing has completed. All structures shall be prepared for testing by plugging the outlets or providing proper standpipes. The structure shall be filled to the proper operating depth and maintained at that level for (7) days. No leakage will be allowed

C. All cracks, leaks, and irregularities shall be properly and aesthetically repaired by the contractor at no additional expense to the Owner. All repairs shall be completed to the satisfaction of the Owner.

D. Water Holding Structures include but are not limited to the MBR equipment and buried concrete tanks.

E. Testing procedures and results shall be submitted to the Engineer for DEQ approval.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

2. Testing agency shall immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

3. Testing agency shall report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

i. Project name.

ii. Name of testing agency.

iii. Names and certification numbers of field and laboratory technicians performing inspections and testing.

iv. Name of concrete manufacturer.

v. Date and time of inspection, sampling, and field testing.

vi. Date and time of concrete placement.

vii. Location in Work of concrete represented by samples.

viii. Date and time sample was obtained.

ix. Truck and batch ticket numbers.

x. Design compressive strength at 28 days.

xi. Concrete mixture designation, proportions, and materials.

xii. Field test results.

xiii. Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

xiv. Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Engineer.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. but less than 25 cu. yd. plus one set for each additional 50 cu. yd. or fraction thereof.
    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
    a. One test hourly when air temperature is 40 ° F and below or 80 ° F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M:
    a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M.
    a. Test one set of two laboratory-cured specimens at seven days and one set of two

specimens at 28 days.

b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.

c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests:

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Engineer.

i. Acceptance criteria for concrete strength shall be in accordance with ACI 350.5 section 1.6.7.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.

2. Diaper hydraulic equipment used over concrete surfaces.

3. Prohibit vehicles from interior concrete slabs.

4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

SECTION 03 60 00
GROUT AND REPAIR MORTAR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This section includes, but not limited to, the following:

1. Grouting of structural base plates, equipment baseplates and other miscellaneous uses of non-shrinking grout.
2. Epoxy grouting of anchor bolts and reinforcing bars to be installed in hardened concrete.
3. Repair of deteriorated concrete surfaces

B. Related Sections include, but are not limited to, the following:

1. Division 5 Section “Metal Fabrications; Stairs; Gratings; Decking; Framing”
2. Division 3 Section “Reinforcing Steel”
3. Division 3 Section “Precast Structural Concrete; Cast-In-Place Concrete”

1.03 SUBMITTALS

A. The Contractor shall submit manufacturers’ information indicating the application, formulation, and installation procedures for each brand and type of grout to be used.

1.04 PRODUCT HANDLING

A. Delivery of Materials: Materials shall be delivered to the project site in original, new and unopened containers bearing the manufacturer’s name and label showing at least the following information:

1. Name of material.
2. Federal specification number, if applicable.
3. Manufacturer’s name.
4. Contents by volume for major constituents.
5. Handling instructions.
6. Application instructions.

B. Storage of Materials: Materials shall be stored to prevent moisture contamination, damage, and deterioration of grout materials.

C. Protection: Materials and Work shall be protected before, during and after installation of the grout.

PART 2 - PRODUCTS

2.01 NONSHRINKING GROUT

A. Nonshrinking Grout shall be: Sika Grout 212; Master Builders "Masterflow 713 Grout"; Savereisen Cement "F-100 Level Fill Grout"; U.S. Grout "Five Star Grout"; or USM "Upcon" or equal.

2.02 EPOXY GROUT

A. Adhesive: Two-component liquid equal to: Thermal-Chem “Mortar Resin Products M3”; Minwax “Por-Rok Anchoring Cement”, or equal.

B. Aggregate: As recommended by the epoxy grout manufacturer.

2.03 REPAIR MORTAR

A. The material to be used for repair of the Bar Screen structure shall be two-component, polymer-modified, cementitious, non-sag mortar equal to SikaTop-123 Plus” with FerroGard 901 penetrating corrosion inhibitor.

2.04 QUICK SETTING HYDRAULIC CEMENT

A. Quick setting hydraulic cement shall be SikaSet Plug, or equal

2.05 SETTING ANCHOR BOLTS/DOWELS

A. High strength adhesive shall be Simpson Strong-Tie AT-XP, or equal.

2.06 WATER

A. Clean and free of deleterious substances.

PART 3 - EXECUTION

3.01 NONSHRINKING GROUT

A. General: Nonshrinking grout shall be furnished factory-premixed so only water is added at the project site. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout as recommended by the manufacturer.

B. Preparation: Concrete to receive nonshrinking grout shall be saturated with water for 24 hours prior to grouting.

C. Placement: Grout shall be placed in strict accordance with the directions of the manufacturer so all spaces and cavities below the top baseplates or against concrete slabs or walls are completely filled without voids. Forms shall be provided where structural components of baseplates or launders will not confine the grout.

D. Finishing: The grout shall be finished smooth in all locations where the top surface or edge of the grout will be exposed to view after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate, bedplate, member, or piece of equipment.

E. Curing: Nonshrink grout shall be protected against rapid loss of moisture by covering with wet rags or polyethylene sheets. After edge finishing is complete, the grout shall be

wet cured for at least 7 days.

3.02 EPOXY GROUT

A. General: Components shall be packed separately at the factory and field mixed. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

B. Preparation: Where indicated on the Drawings, anchor bolts and reinforcing bars shall be epoxy grouted in holes drilled into hardened concrete. Diameters of holes shall be ¼ inch larger than the maximum dimension of the bolt head, and ½ inch larger than the bar diameter. The embedment depth for epoxy-grouted anchor bolts and reinforcing bars shall not be less than ten bolt or bar diameters unless indicated otherwise on the Drawings.

1. Holes shall be prepared for grouting as recommended by the grout manufacturer.

C. Installation: Anchor bolts and reinforcing bars shall be clean, dry, and free of grease and other foreign matter at the time of installation. The bolts and bars shall be set and positioned and the epoxy grout shall be placed and finished in accordance with the recommendations of the grout manufacturer. Particular care shall be taken to insure that all spaces and cavities are filled with epoxy grout, without voids.

3.03 REPAIR MORTAR

A. General: Components shall be packed separately at the factory and field mixed. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

B. Preparation: Where indicated on the Drawings, the surfaces to receive repair mortar shall be cleaned and completely free of deleterious substances, standing or adhered water and shall be prepared in strict accordance with the manufacturer's requirements before the repair mortar is mixed and applied.

C. Installation: All surfaces shall be clean, dry, and free of grease and other foreign matter at the time of installation. The mortar shall be placed and finished in accordance with the recommendations of the manufacturer. Particular care shall be taken to insure that all spaces and cavities are filled with repair mortar, without voids.

3.04 QUICK SETTING HYDRAULIC CEMENT

A. General. Contents shall be packaged at the factory and mixed with water in the field to obtain the desired consistency. Proportioning and mixing shall be in accordance with the manufacturer's recommendations.

B. Preparation. The concrete area to receive quick setting hydraulic cement should be thoroughly cleaned and lightly dampened just prior to application.

C. Installation. The quick setting hydraulic cement shall be placed and finished in accordance with the recommendations of the grout manufacturer. Particular care shall be taken to insure that all spaces and cavities are filled without voids.

3.05 USES OF GROUT

A. Non-shrink grout shall be used beneath all equipment bases and other locations shown on the Drawings or specified herein. Grouting thicknesses and application shall meet the equipment manufacturer's requirements.

B. Epoxy grout shall be used at locations shown on the Drawings or specified herein. Repair of rock pockets or surface defects in concrete work approved for repair by the Engineer shall generally be repaired with epoxy grout unless otherwise directed by the Engineer.

C. Anchor bolts approved by the Engineer for installation in concrete shall be set in high-strength anchoring adhesive unless otherwise directed by the Engineer. This adhesive shall not be used in contact with potable water.

D. Quick setting hydraulic cement shall be used at locations shown on the Drawings or specified herein. All penetrations/joints in concrete manholes, vaults, or structures where a watertight seal is required shall use this type of grout.

END OF SECTION 03 60 00

DIVISION 5

METALS

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Metal floor plate.
3. Metal Canopies.
4. Miscellaneous steel trim.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete.

1.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
    a. Furnish ICBO Evaluation reports, product data, and installation instructions for post-installed anchors.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.03 INFORMATIONAL SUBMITTALS

A. Adhesive Anchors. Furnish the following:

1. Manufacturer's past project experience data on at least three similar projects supplied with proposed system within the last three years, to include client name, address, contact person, phone number, project location, and description of work.
2. Test reports for each batch of adhesive delivered to site. Provide manufacturer's written certification that each batch delivered meets these Specifications, the intended uses on project, and capability to bond to damp or wet concrete surfaces.

3. Manufacturer's written letter of certification identifying contractor employees qualified for installing adhesive anchors, trained through jobsite instruction conducted by manufacturer.

4. Furnish specific written statement from EPA and health agencies that the adhesive product is acceptable for use in potable water structures or conveyances prior to use on this project.

B. All Concrete Anchors. Provide specific instructions or all phases of installation including hole size, preparation, placement, and procedures. Provide also specific instructions for safe handling and installation of all anchors to Contractor staff handling and installing these anchors.

1.04 QUALITY ASSURANCE

A. Qualifications. Qualify welding operators in accordance with requirements of current AWS Standard Qualification Procedure D1.1, Chapter 5.

1. Qualification Tests. Performed by a recognized testing laboratory.

B. Certification. Certify welders of structural and reinforcing steel for all positions of welding in accordance with such procedure.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipment.

1. Insofar as practical, factory assemble items specified herein.

2. Package and clearly tag parts and assemblies that are of necessity shipped unassembled, in a manner that will protect materials from damage, and facilitate identification and field assembly.

B. Storage of Adhesive Products.

1. Store components on pallets or shelving in a covered storage area with locking door.

2. Control temperature within 41 degrees F to 77 degrees F and dispose of product if shelf life has expired.

3. If stored at temperatures above manufacturer's recommended maximum, test components prior to use to determine if they still meet specified requirements.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Like Items of Materials. End products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

B. Lifting Lugs. Provide on equipment and equipment components weighing over 100 pounds.

2.02 GENERAL

A. Furnish miscellaneous items.

1. Miscellaneous metal work and castings as shown, or as required to secure various parts together and provide a complete installation.

2. Items specified herein are not intended to be all-inclusive. Provide metal work and castings shown, specified, or which can reasonably be inferred as necessary to complete the project.

2.03 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A588, Grade 50.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

E. Rolled-Stainless Steel Floor Plate: ASTM A793, Type 316L.

F. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.

2. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33 , with G90 coating; 0.108-inch nominal thickness.

H. Aluminum Structural Shapes & Plates: Alloy 6061-T6, meeting referenced specifications & ASTM sections found in Aluminum Association current Construction Manual Series

I. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

J. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

K. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.04 FASTENERS

A. General: Unless otherwise indicated, provide ASTM A193, Type 316stainless steel fasteners if not permanently embedded in concrete, but located outdoors in areas subject to the weather; chemical handling areas; equipment rooms subject to drainage, leakage, and washdown; and in galleries and trenches.

1. Provide stainless steel fasteners for fastening aluminum and stainless steel.

2. ASTM A307 or A36 with ASTM A153 galvanized if not permanently embedded in concrete, and not used for structural steel or piping, but located indoors where wash down, leakage, and drainage are not likely to occur (e.g., in personnel

buildings excluding laboratories, on motor floors, in electrical equipment rooms, and in control rooms).

3. For Flanges of Piping, Valves, and Other Similar Connections. As specified in other sections, or as shown.

4. Tie Rod assemblies:

   a. ASTM A307A or A36 with ASTM A153 galvanized for threaded rods.

   b. ASTM A668 Class A with ASTM A153 galvanized for clevises and turnbuckles.

   c. ASTM A307A or A36 with ASTM A123/A153 galvanized for clevis pins.

B. Anchor Bolts:

1. Nonsubmerged Use:

   a. Galvanized Steel. For equipment and machinery, where permanently anchored into concrete, unless otherwise shown.

   b. Diameter, Length, and Bend Dimensions. As required by equipment or machinery manufacturer. Unless otherwise required by calculations for seismic or other loadings, provide 5/8-inch minimum diameter and other geometry as shown.

   c. Furnish minimum two nuts and a washer of same material for each bolt.

   d. Provide sleeves as required or as shown for location adjustment.

2. Submerged Use:

   a. Submerged use is defined as any connection below a point 1 foot 6 inches above maximum water surface elevation in a water holding basin.

   b. As specified for nonsubmerged use, for anchoring equipment, machinery or other connection except as follows:

      1) 316 stainless steel.

3. For anchoring fabricated metal work or structural building columns, or other components where connections will be protected or dry.

   a. Galvanized steel.

   b. Minimum Size. 5/8-inch diameter by 12-inch long, unless otherwise shown or required by calculations.

   c. Furnish two nuts and one washer per bolt of same material as bolt, unless otherwise shown.

4. For anchoring fabricated metal work or structural building, or structural frame components in areas of wet use, wash down areas, or areas outside heated buildings.

   a. Galvanized steel.

b. Minimum Size. 5/8-inch diameter by 12-inch long, unless otherwise shown or required by calculations.

c. Furnish two nuts and one washer per bolt of same material as bolt, unless otherwise shown.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors as indicated in Drawings.

1. Manufacturer:

a. Dewalt Anchors

b. Hilti, Inc.

c. Simpson Strong-Tie

d. Or approved equal.

2.05 ANCHOR BOLT SLEEVE

A. Fabricated Steel Sleeve.

1. Material. A36 steel.

2. Dimensions, welding, and sizes as shown.

2.06 MISCELLANEOUS MATERIALS

A. Weld Electrodes: Provide weld electrodes that are compatible with the connected base metal(s).

1. Use E70xx electrode to weld carbon steel base metals.

2. Use low-alloy E80xx-W to weld weathering steel base metals.

3. Use 308L electrode to weld austenitic stainless steel (types 301, 302, 304, 305 stainless steel) base metals.

4. Use 316L electrode to weld type 316 and 316L stainless steel base metals.

B. Shop Primers: Provide primers that comply with Section 09 90 00 "Painting and Coating" and Section 09 90 02 "High Performance Painting and Coating".

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Stainless Steel Fastener Lubricant (Antiseizing)

1. Provide for stainless steel nuts and machined bolts, anchor bolts, concrete anchors, and all other threaded fasteners.

2. Lubricant shall contain substantial amounts of molybdenum disulfide, graphite, mica, talc, or copper as manufactured by:

a. Loc Tite Co., Permatex.

b. Or equal.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.07 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches from ends and corners of units and 24 inches o.c.

2.08 MISCELLANEOUS FRAMING AND SUPPORTS

A. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.09 METAL FLOOR PLATE

A. Fabricate from rolled-stainless steel floor plate of thickness indicated below:

1. Thickness: As indicated.

B. Provide stainless steel angle supports as indicated.

C. Provide flush stainless steel bar drop handles for lifting removable sections, one at each end of each section.

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Prime miscellaneous steel trim with primer specified in Section 09 90 02 "High-Performance Painting & Coating."

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 09 90 00 "Painting and Coating" primers specified in Section 09 90 02 "High Performance Painting and Coating" unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

1. Do not begin installation until concrete or masonry receiving anchors have attained design strength.

2. Do not install an anchor closer than six times its diameter to either an edge of concrete or masonry, or to another anchor, unless specifically shown otherwise.

E. Apply specified antiseizing lubricant to threads prior to making up connections.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with expansion anchors .

D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

3.03 ELECTOLYTIC PROTECTION

A. Aluminum.

1. Where in contact with dissimilar metals, or embedded in masonry or concrete, protect surfaces as specified in Section 09 90 00 “Painting and Coating”.

2. Allow paint to dry before installation of the material.

3. Protect painted surfaces during installation.

4. Should coating become marred, prepare and touch up per paint manufacturer's written instructions.

B. Where titanium equipment is in contact with concrete or dissimilar metals, provide full-face neoprene insulation gasket, 3/32-inch minimum thickness and 70 durometer hardness.

3.04 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.05 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

DIVISION 7

THERMAL & MOISTURE PROTECTION

SECTION 07 11 00
DAMPPROOFING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the work necessary to furnish and install, complete, all below-grade dampproofing.

1.02 RELATED SECTIONS

A. Division 3 – Concrete & Grout

1.03 GENERAL

A. See the GENERAL CONDITIONS and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

1.04 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 30 00, SUBMITTALS in Division 1, GENERAL REQUIREMENTS.

B. Submit the following:

1. Manufacturer’s Literature: Submit manufacturer's literature, specifications, and application instructions for dampproofing materials.

2. Certificate: Submit manufacturer's certificate of conformance with these Specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and catalog number is for the purpose of establishing the standard of quality desired only. Products of other manufacturers will be considered in accordance with the General Conditions.

2.02 DAMPPROOFING

A. Asphalt compound of brush or spray consistency conforming to Federal Specification SS-A-701 or ASTM D449, Type A; A.C. Horn Dehydratine 4; J & P Petroleum Products Tex-Mastic No. 720; W.R. Meadows, Inc. Spray-Mastic; Sonneborn Hydrocide 700B; or equal.

PART 3 - EXECUTION

3.01 ENVIRONMENTAL REQUIREMENTS

A. Do not start work until the following environmental requirements are met.

B. Do not proceed with application of materials when ambient temperature is less than 50° F.

C. Do not apply dampproofing in rainy conditions or within 3 days after surfaces become wet from rainfall or other moisture.

D. Do not apply materials when low temperature of 40 degrees F or less is predicted within a period of 24 hours after application.

3.02 INSPECTION

A. Examine surfaces to receive dampproofing to assure conditions are satisfactory for application of materials.

3.03 SURFACE PREPARATION

A. Clean surfaces to remove dust, dirt, oil, wax, efflorescence, and other foreign materials, in accordance with dampproofing manufacturer's instructions.

B. Remove efflorescence by scrubbing surface with muriatic acid and thoroughly rinsing with water.

C. Allow 3 days drying time following washing down of substrate surfaces.

D. Fill all cracks, voids, and honeycombs with mortar to provide sound surface for dampproofing.

3.04 APPLICATION

A. Apply dampproofing with a brush, or with manufacturer-approved low pressure airless spray equipment with a coarse nozzle.

B. Apply materials at rate and as recommended by the manufacturer and in two coats.

C. Start application at top of wall and work down surface, keeping a wet edge at all times, forming a continuous, unbroken film, free from pinholes and other surface breaks.

3.05 ADJUST AND CLEAN

A. Clean spillage and overspray from adjacent surfaces as recommended by manufacturer.

3.06 FIELD QUALITY CONTROL

A. After dampproofing has dried, spray coat surfaces with water.

B. Recoat surfaces that show water absorption, as recommended by manufacturer. To prevent blistering, protect surfaces from heat and direct sunlight until dried, then backfill.

3.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original sealed containers, clearly marked with manufacturer's name, brand name, and type of material.

B. Store materials in area where temperatures are not less than 50 degrees F or over 85 degrees F, unless otherwise authorized by manufacturer.

3.08 APPLICATION SCHEDULE

A. *Apply dampproofing to all exterior surfaces of all cast-in-place and pre-cast concrete structures below finish ground level to at least 4" above finished ground surface.* Do not apply to interior of water holding basins.

END OF SECTION 07 11 00

SECTION 07 21 00
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Extruded polystyrene rigid board insulation
2. Spray insulation

1.02 SUBMITTALS

A. General: Submit in accordance with Section 01 33 00.

B. Product Data: Submit product data and manufacturer's instructions for each product.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish each insulation type from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 60 00.

B. Identify products with appropriate markings of applicable testing and inspecting organization.

C. Storage and Protection:

1. Store materials raised off floor or ground and under cover to keep dry.
2. Protected from weather, direct sun light, contamination, sources of ignition, and damage from construction operations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Extruded polystyrene rigid board insulation

1. Manufacturer:
   a. Owens Corning Foamular 250;
   b. Dow Styrofoam;
   c. Approved equal
2. General Requirements:
   a. Thickness/R value per drawings.
3. Location:
   a. Where indicated on the design drawings – above process yard piping with

inadequate burial.

B. Closed Cell Spray Foam Insulation
   1. Manufacturer:
      a. Johns Manville Corbond III or approved equal.
   2. Location:
      a. Door and window gaps
      b. May be used as substitution for batt insulation where approved by Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and proceed with work in accordance with Section 01700.

B. Verify that work of other trades which will be covered by insulation is complete, approved, and tested.

3.02 INSTALLATION

A. General:
   1. Install in strict accordance with manufacturer's recommendations including specific requirements per product type below.

B. Protect finished work in accordance with Section 01 70 00.

END OF SECTION 07 21 00

SECTION 07 25 00
WEATHER BARRIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings

1.02 SUMMARY

A. Section Includes:

1. Underslab Vapor Barrier
2. Commercial weather barrier assemblies.
3. Flexible flashing.
4. Weather barrier flashing.
5. Fluid-applied flashing.
6. Weather barrier accessories.
7. Drainage material.

B. Related Requirements:

1. Section 07 90 00 – Joint Sealers
2. Section 07 21 00 – Building Insulation

1.03 DEFINITIONS

A. Vapor Barrier: A combination of materials and accessories that prevent the movement of vapors from a building's exterior to its interior.

B. Weather Barrier: A combination of materials and accessories that do the following:

1. Prevents the accumulation of water as a water-resistive barrier.
2. Minimizes the air leakage into or out of the building envelope as a continuous air barrier.
3. Provides sufficient water vapor transmission to enable drying as a vapor-permeable membrane.

C. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly per International Building Code Section 1403.2.

D. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of the building envelope per ASHRAE 90.1 section 5.4.3.1.

E. Vapor Diffusion: A slow movement of individual water vapor molecules from regions of higher to lower water vapor concentration (higher to lower vapor pressure).

F. Vapor Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E 96 per definition in International Building Code. Vapor permeable material permits the passage of moisture vapor through vapor diffusion.

1.04 SUBMITTALS

A. Product Data: For each type of product.

1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

2. Provide SDS, third-party certifications, or product technical data.

B. Evaluation Reports: For weather barrier and flexible flashing, from ICC-ES.

C. Manufacturer’s Instructions: For installation of each product specified.

D. Qualification Data: For Installer

E. Sample Warranty: For manufacturer's warranty.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store near heat source or open flame.

1.07 WARRANTY

A. Manufacturer’s Product Warranty: To repair or replace weather barrier product that fails in materials within specified warranty period.

1. Warranty Period: 10 years from date of purchase.

B. Manufacturer’s Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier that fails in materials within specified warranty period, including removal and replacement of affected construction up to manufacturer’s limits.

1. Warranty Period: 10 years from date of purchase.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain weather barrier assembly components, including weather barrier flashing from same manufacturer as weather barrier or manufacturer approved by weather barrier manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures, without failure due to defective manufacture of products.

B. High-Performance Installations:

1. For installation with one of the following building envelope performance or structural characteristics:

a. Exceeding 65 mph equivalent structural load.

b. Exceeding 15 mph equivalent wind-driven rainwater infiltration.

c. Buildings with 60 feet or more total height above grade plane, as defined in the International Building Code.

d. Construction with gypsum or cement-based exterior sheathing.

e. Non-wood based primary structure such as: stel, light gage steel, masonry or concrete.

2.03 BELOW SLAB VAPOR BARRIER

A. W. R. MEADOWS®, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com.

B. Accessories:

1. Seam Tape

a. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4".

b. PERMINATOR EVOH TAPE by W. R. MEADOWS.

C. Double Sided Seam Tape

1. Double sided butyl tape for overlap sealing in gas barrier installations. Minimum width 2" (50 mm).

2. PERMINATOR EVOH BUTYL TAPE by W. R. MEADOWS.

D. Pipe Collars

1. Construct pipe collars from gas barrier material and pressure sensitive tape per manufacturer’s instructions.

2.04 WEATHER BARRIER

A. Commercial Building Wrap: ASTM E 2357 passed, ABAA (Air Barrier Association of America) evaluated air barrier assembly, and assembly water resistance per ASTM E 331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E 84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap or a comparable product by one of the following:

a. Approved equal.

2. System Description, Single-Layer Weather Barrier: Single-layer weather barrier, including flashing and sealing of penetrations and seams.

B. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; FlexWrap™ NF or comparable product by one of the following.

a. Approved equal.

C. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, dual-sided, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; StraightFlash or comparable product by one of the following:

a. Approved equal.

2.05 FLUID-APPLIED FLASHING

A. Fluid-Applied Flashing: Trowel or brush applied, non-water soluble, single component, silyl terminated polyether technology (STPE), vapor permeable, flashing material.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Fluid Applied Flashing & Joint Compound+ or comparable product by one of the following:

a. Approved equal.

2.06 WEATHER BARRIER ACCESSORIES

A. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by weather barrier manufacturer for sealing joints and penetrations in commercial building wrap.

1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Tape.

B. Closed-Cell Polyurethane Foam Insulation: Low pressure, low expansion, single component polyurethane foam, with maximum flame-spread and smoke-developed indexes of 15 and 25, respectively, per ASTM E 84.

1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; DuPont™ Window & Door Foam.

C. Fasteners with Self-Gasketing Washers: Commercial building wrap manufacturer's recommended pneumatically or hand-applied fasteners with 1-inch diameter, high-density polyethylene cap washers with UV inhibitors.

1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Wrap Caps.

D. Primer for Flashings: Synthetic rubber-based product; spray applied. Strengthen adhesive bond at low temperature applications between weather products such as self-adhered flashing products, commercial building wraps, and common building sheathing materials.

1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company, DuPont™ Adhesive Primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements.

B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.

1. Verify that rough sill framing for doors and windows is sloped downwards towards the exterior and is level across width of the opening.

C. Verify that surfaces to receive weather barrier flashing are clean, dry, and free of frost.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Direct water onto an acceptable weather barrier drainage plane with an unobstructed path to exterior of wall.

1. Provide a drainage path for water intrusion through window and door attachment system that collects at window and door sills and directs water to the exterior or weather barrier.

3.03 COMMERCIAL BUILDING WRAP INSTALLATION

A. General: Comply with weather barrier manufacturer's written instructions and warranty requirements.

B. Cover exposed exterior surface of sheathing with weather barrier securely fastened to framing immediately after sheathing is installed.

1. Maintain continuity of air and water barrier assemblies.

2. Start weather barrier installation at a building corner, leaving 12 inches of weather barrier extended beyond corner to overlap.

3. Install weather barrier horizontally starting at lower portion of wall surface.

4. Provide minimum 6 inches overlap at horizontal- and vertical-wrap seams in a shingle manner to maintain continuous downward drainage plane and air and water barrier.

C. Seams: Seal seams with building wrap tape per manufacturer's recommended installation instructions.

1. Shiplap horizontal seams in weather barrier to facilitate proper drainage.

D. Fasteners: Use weather barrier manufacturer’s recommended fasteners to secure weather barrier and install fasteners according weather barrier manufacturer’s installation guidelines.

1. Do not use temporary fasteners to permanently attach weather barrier.
2. Do not place fasteners with gasketing washers where weather barrier flashing will be installed.
3. Install fasteners with gasketing washers through flashing where recommended by manufacturer.

E. Openings: Completely cover openings with weather barrier, then cut weather barrier membrane to openings according to weather barrier manufacturer's installation guidelines.

1. Provide head and jamb flaps and seam overlaps to maintain continuous drainage.
2. Repair damage to weather barrier using method recommended by weather barrier manufacturer.
3. Install flashing according to weather barrier manufacturer's installation guidelines.

3.04 WEATHER BARRIER FLASHING INSTALLATION

A. Installation: Remove wrinkles and bubbles, reposition weather barrier as necessary to produce a uniform, smooth surface.

1. Ensure that ambient and substrate surface temperatures are acceptable in accordance with manufacturer instructions and recommendations.
2. Wipe surfaces to remove moisture, dirt, grease and other debris that could interfere with adhesion.
3. Apply weather barrier manufacturer’s recommended primer over concrete, masonry, and glass-mat gypsum wall sheathing substrates to receive weather barrier flashing.
4. Lap weather barrier flashing a minimum of 2 inches onto weather barrier.
5. Apply pressure over entire surface using roller or firm hand pressure.

B. Rough

1. Apply 6-inch wide conformable weather barrier flashing at door and window sills.
2. Ensure that sill flashing does not slope to the interior.
3. Install backer rod in joint between frame of opening product and flashed rough opening on the interior.
4. Apply sealant or closed-cell polyurethane foam insulation around entire opening/fenestration product to create air seal around interior perimeter of window openings in accordance with weather barrier manufacturer’s instructions.
5. Around door and window openings, apply butyl-based flashing to flaps of weather

barrier.

6. Use strip flashing with wrap cap screws to secure head flap of the windows.

C. Penetrations: Apply weather barrier manufacturer's recommended weather barrier flashing patches behind fastening plates, such as brick-tie base plates, metal-flashing clips, and metal channels.

1. Seal weather barrier around each penetration with weather barrier manufacturer's recommended self-adhered flashing product or sealant. Integrate products with flanges into the weather barrier.

D. Terminations: Provide minimum 2 inches overlap using strip flashing on adjoining roof and base of wall systems to maintain continuous downward drainage plane.

1. Secure Secure weather barrier with fasteners and weather-barrier flashing.

3.05 FLUID-APPLIED FLASHING INSTALLATION

A. General: Before installing fluid-applied flashing, do the following:

1. Ensure drainage path is not blocked or disrupted. Do not install on walls that do not feature a continuous path for moisture drainage. Blocked or disrupted paths for drainage can result in excess moisture buildup in wall cavity. Do not install below grade.

2. Remove surface dust, dirt, and loose mortar.

3. Verify that surface is free of grease and other contaminants and that surface is smooth.

4. Fill joints in concrete masonry units, and voids in cast-in-place concrete with trowel-applied fluid-applied flashing to ensure surface is flush and smooth.

5. Allow masonry mortar and cast-in-place concrete a minimum of 24 hours to cure before installing fluid-applied flashing.

B. Fluid-Applied Flashing Installation: Using a trowel or brush, apply fluid-applied flashing around perimeter of window and door openings to a minimum thickness of 25 mils

1. Extend flashing a minimum of 2 inches onto exterior face of adjacent surface.

2. Inspect for gaps and pinholes in fluid-applied flashing and apply additional coats until no gaps and pinholes appear.

3. Joint Applications: Using a trowel or a brush, fill cracks and voids up to 1/4 inch in width.

a. For joints and cracks between 1/4 and 1/2 inch wide, cover first with mesh tape.

b. For joints and cracks between 1/2 and 1 inch wide, cover first with butyl-based strip flashing.

c. Apply a bead, then trowel smooth.

d. Seam coverage should be a minimum of 2 inches wide and 15 to 20 mils thick.

e. Inspect for gaps and pinholes in fluid-applied flashing and apply additional coats until no gaps and pinholes appear.

3.06 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material with grooves or channels running vertically in compliance with manufacturer's written instructions.

3.07 CLEANING

A. Immediately remove release paper and scrap from work area and dispose of material in accordance with disposal requirements.

3.08 PROTECTION

A. Protect installed weather barrier from the following:

1. Damage from cladding, structure, or a component of the structure (e.g., window, door, or wall system).
2. Contamination from building site chemicals, premature deterioration of building materials, or nonstandard use or application of products.
3. Foreign objects or agents, including the use of materials incompatible with weather barrier products.
4. UV exposure in excess of products' stated limits.

END OF SECTION 07 25 00

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, copings, and other items indicated in Schedule.

B. Reglets and accessories.

1.02 RELATED SECTIONS

A. 07 46 00 – Steel Siding *(if applicable)*

B. 07 53 00 – Elastomeric roofing *(if applicable)*

C. 07 90 00 – Joint Sealants

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Shop Drawings:

1. Identification of material, thickness, and finish for each item.

2. Profiles and dimensions for each item.

D. 4”x4” Color sample of each metal flashing type for verification.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with seven years of experience..

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

A. Warrant installed system to be free of leaks and free from defects in materials and workmanship for 2 years from date of Substantial Completion of project.

B. Warrant factory applied fluorocarbon finish to be free of cracks, splits, crazing, chipping, peeling, and color fading for 10 years from date of Substantial Completion of Project

PART 2 - PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653, with G90 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA
2605; multiple coat, thermally cured fluoropolymer finish system.

2. Color: To match approved sample

a. All locations adjacent to or in contact with Metal Wall Panel: Use same color as Metal Wall Panel.

b. All locations adjacent to or in contact with Coping: Use same color as Coping

2.02 ACCESSORIES

A. Fasteners: fasteners of a compatible metal to avoid electrolytic reaction and per manufacturers
recommendations.

B. Primer: Type per manufacturer.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Sealant: Type as specified in Section 07 90 05.

E. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

C. Roof Edge Membrane:

1. Coordinate with roofing manufacturer's requirements.

D. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. General:

1. Install metal work in accordance with SMACNA.

2. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.

3. Apply asphalt mastic on metal surfaces of units in contact with cementitious materials and dissimilar metals.

4. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

5. Miter, lap seam and close corner joints with solder. Seal seams and joints watertight.

6. Install expansion joints at frequency recommended by SMACNA. Do not fasten seams such that movement is restricted.

7. Coordinate with installation of roofing system and roof accessories.

B. Flashing

1. Insert flashings into reglets to form tight fit. Secure in place with wedges at maximum 12 inches on center. Seal flashings into reglets with sealant.

2. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Architect.

C. Termination Bar *(if applicable)*

1. Install termination bar at top edge of roofing membrane. Install sealant behind roofing membrane at line of termination. Attach bar with appropriate fasteners using predrilled holes.

D. Counterflashing:

1. Fabricate counterflashings as 2 piece assemblies to permit installation of counterflashing after base flashings are in place.
2. Install continuous preformed butyl sealant tape behind fastener line of surface mounted reglets in accordance with manufacturer's written instructions. Apply silicone weather seal at top edge. Prevent contact between different sealing materials.
3. Overlap composition base flashing 4 inches minimum.
4. Install bottom edge tight against base flashing.
5. Lap seam vertical joints 3 inches minimum and apply sealant.

E. Coping *(if applicable)*

1. Space seams: 8’-0" apart maximum.
2. Lock exterior edges over continuous galvanized cleats secured to nailer.
3. Slope towards inside of parapet, 1/2 inch minimum, unless indicated otherwise.
4. Fasten interior edges to nailer with HWH screw and washer at 12 inch centers.
5. Provide integral drainage system at seams to prevent water infiltration.
6. Miter corners

F. Apply plastic cement compound between metal flashings and felt flashings.

3.04 SCHEDULE

A. Copings: 22 ga.

B. Joint Covers: 22 ga

C. Flat Trim: 20 ga

D. Counterflashings at Roofing Terminations (over roofing base flashings): 20 ga

E. Counterflashings at Curb-Mounted Roof Items, including skylights and roof hatches: 20 ga

F. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: 24 ga

3.05 CLEANING

A. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with washing soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.

END OF SECTION 07 62 00

SECTION 07 65 00
FLEXIBLE FLASHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Provides flashing systems, moisture-retardant membranes, including sealing joints and protrusions through membranes, with accessories as required for complete installation.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's literature for each type of membrane.

B. Samples: Submit samples of each type of material. Quality Assurance/Control Submittals: Submit either test reports or manufacturer's certificates indicating materials comply with specified requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Fortifiber Building Systems Group, 1-800-773-4777.

B. Substitutions: Comply with provisions of Division 1.

2.02 MATERIALS

A. Flexible Flashings: Fortifiber/ FortiFlash self-adhesive, self-sealing SBS modified asphalt waterproof membrane laminated to high density, cross-laminated polyethylene film reinforcement

1. Types:

a. Waterproof: Fortifiber / FortiFlash 25 mil and 40 mil Waterproof Flashing.

2. Reference Standards: ICC Acceptance Criteria 148 (waterproof).

3. Water Vapor Permeance: <.08 perms 25-Mil, <.05 perms 40-Mil (waterproof); ASTM F 1249.

4. Water Resistance: 200 hours (waterproof); ASTM D-779

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure items which pass through membrane are properly and rigidly installed, substrate is free of projections and irregularities which may be detrimental to proper installation of membrane.

3.02 INSTALLATION

A. Apply membrane in accordance with manufacturer's recommendations, laid smooth without folds or bunches of material.

1. Seam Overlap: As recommended by building paper manufacturer for specific building paper material and application indicated.
2. Sealing: Seal items projecting through vapor retarders and vapor barriers.

B. Inspect and repair building paper prior to application of finish material over building paper; tape tears, perforations and similar damage.

END OF SECTION 07 65 00

SECTION 07 90 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes the work necessary to furnish and install, complete, sealant and backing for all structure and building joints.

1.02 GENERAL REQUIREMENTS

A. See CONDITIONS OF THE CONTRACT and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

B. Performance: Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00, SUBMITTALS in Division 1, GENERAL REQUIREMENTS.

B. Submit the following:

1. Product data: Submit manufacturer's literature, specifications, surface preparation and application instructions for joint sealant materials.

2. Samples: For each material proposed submit sample of color intended, when required to match joint substrate or range of colors for selection.

3. Sealant schedule: Submit sealant schedule indicating joint size and special conditions as well as, manufacturer, type and color of proposed product for each application.

4. Certificates of compliance: proposed materials meet reference standards and specification requirements.

5. Contract closeout submittals: special guarantee.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealants to the jobsite in sealed containers, each bearing manufacturer's name and product designation.

B. Store and protect sealant products from damage, deterioration, and contamination in accordance with manufacturer's written recommendations.

1.05 QUALITY ASSURANCE

A. Installer qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this project and whose work has resulted in joint sealant installations with a record of successful in-service performance.

1.06 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature: Between 40 and 80°F when sealant is applied.

1.07 SPECIAL GUARANTEE

A. Product: Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction or, at the option of Owner, removal and replacement of work specified in this section found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective work shall be as specified in the General Conditions.

B. Conditions: No adhesive or cohesive failure of sealant.

C. Sealed joints: watertight and weathertight with normal usage.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Conditions.

2.02 MASTIC JOINT FILLER

A. The mastic joint filler shall be a ½-inch, pre-molded, non-extruded, resilient type mastic joint filler conforming to ASTM D 1751.

2.03 SEALANT MATERIALS

A. Type 1 - Silicone, Non-sag, Not Immersible: Silicone base, single-component, chemical curing; meeting the requirements of Federal Specification TT-S-001543, non-sag type, Class A; capable of withstanding movement up to 50 percent of joint width; Shore "A" hardness of 50 maximum; non--staining. Use No. 790 manufactured by Dow Corning Corporation; "Silpruf" manufactured by General Electric; or equal.

B. Type 2 - Multi-Part Polyurethane, Self-Leveling, Immersible: Polyurethane base, multi-component, chemical curing; meeting the requirements of Federal Specifications TT-S-00227, self-leveling Type I, Class A; capable of being continuously immersed in water, withstand movement of up to 25 percent of joint width; uniform, homogeneous, and free from lumps, skins, and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining, nonbleeding. Use Sonolastic Paving Joint Sealant manufactured by Sonneborn; Urexspan NR-200 manufactured by Pecora Corp.; Iso-Flex 880GB manufactured by H.S. Peterson Co.; Vulkem 245 manufactured by Mameco International; or equal.

C. Type 3 - Multi-Part Polyurethane, Non-sag, Immersible: Polyurethane base, multi-component, chemical curing; meeting the requirements of Federal specifications TT-S-00227, non-sag Type II, Class A; capable of being continuously immersed in water, withstand movement of up to 25 percent of joint width; uniform homogeneous, and free

from lumps, skins, and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining, nonbleeding. Use Iso-Flex 881 manufactured by H.S. Peterson Co.; Vulkem 922 manufactured by Mameco International; PRC 270 manufactured by Product Research Corp.; Sonolastic NP-II manufactured by Sonneborn; or equal.

D. Type 4 - Multi-Part Polyurethane, Non-sag, Not Immersible: Polyurethane base, multi-component, chemical curing; meeting the requirements of Federal specifications TT-S-00227, non-sag Type II, Class A and ASTM C 920, Type M, Grade NS, Class 25; withstand movement of up to 25 percent of joint width; uniform, homogeneous, and free from lumps, skins, and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining, nonbleeding; color as selected. Use Sonolastic NP-II manufactured by Sonneborn; Dynatrol II manufactured by Pecora Corp.; Dymeric manufactured by Tremco; Isoflex 2000 manufactured by H.S. Peterson Co.; Vulkem 227 manufactured by Mameco International; or equal.

E. Type 5 - One-Part Polyurethane, Immersible: Polyurethane base, single-component, chemical curing; conforming to Federal specification TT-S-00230; capable of being continuously immersed in water, withstand movement of up to 25 percent of joint width; Shore "A" hardness of minimum 15 and maximum 50; non-staining, nonbleeding. For non-sag Type II, Class A, use Sonolastic NP-I manufactured by Sonneborn; Sikaflexla No. 430 manufactured by Sika Chemical Corp.; Vulkem 116 manufactured by Mameco International; or equal. For self-leveling Type I, Class A, use Sonolastic SL-1 manufactured by Sonneborn; Vulkem 45 manufactured by Mameco International; Sikaflex 12SL manufactured by Sika Chemical Corp.; or equal.

F. Type 6 - One-Part Polyurethane, Not Immersible: Polyurethane base, single-component, chemical curing; meeting the requirements of Federal specification TT-S-00230, non-sag Type II, Class A; withstand movement of up to 25 percent of joint width; Shore "A" hardness of minimum 15 and maximum 50; non-staining, nonbleeding. Use Dynatrol I manufactured by Pecora Corp.; Dymonic manufactured by Tremco; Sonolastic NP-I manufactured by Sonneborn; or equal.

G. Type 7 - Multi-Part Polysulfide, Immersible: Polysulfide base, two-component, chemical curing; meeting the requirements of Federal Specification TT-S-00227, Type I self-leveling, Type II non-sagging, Class A, uniform, homogeneous and free from lumps, skins, and coarse particles when mixed; capable of being continuously immersed in water, withstand movement up to 25 percent of joint width; Shore "A" hardness of minimum 15 and maximum 50; non-staining and nonbleeding. Use CM-60, two-part manufactured by W.R. Meadows; Sonolastic Two manufactured by Sonneborn; or equal.

H. Type 8 - One-Part Polysulfide, Non-sag, Not Immersible: Polysulfide base, single-component, chemical curing; meeting the requirements of Federal Specification TT-S-00230, Type II non-sag, Class A; capable of withstanding movement up to 20 percent of joint width; Shore "A" hardness of minimum 15 and maximum 50; non-staining and nonbleeding. Use CM-60, one-part manufactured by W.R. Meadows; Sonolastic One manufactured by Sonneborn; Sikaflex 440 manufactured by Sika Chemical Corp.; PRC

7000 manufactured by Product Research Corp.; or equal.

I. Type 9 - One-Part Acrylic Terpolymer, Non-sag: Acrylic base, single-component, solvent curing; meeting the requirements of Federal specification TT-S-00230, Type I non-sag, Class B; capable of withstanding movement up to 7.5 percent of joint width; Shore "A" hardness of maximum 55; non-staining and nonbleeding. Use 60+ Unicrylic manufactured by Pecora Chemical Corp.; Mono manufactured by Tremco; or equal.

J. Type 10 - Sanitary Sealant: Silicone sealant similar to Type 1, above, formulated to resist mold growth and repeated exposure to high humidity while retaining adhesion, flexibility, and color. Use Dow Corning Bathtub Caulk 786; General Electric Sanitary Sealant; or equal.

K. Type 11 - Fire-Resistant Penetration Seal: Medium fire-resistant foam that retains stability at high temperatures. Use 3-6548 Silicone RTV Fire Stop Sealant or Foam manufactured by Dow Corning Corporation; Fire Barrier Caulk CP25 and Putty 303 manufactured by 3M Corp.; General Electric Pensil 851; or equal.

2.04 BACKUP MATERIAL

A. Non-gassing, extruded, closed-cell round polyethylene foam rod compatible with sealant used. Size as shown or as recommended by manufacturers for all joints greater than 3/16-inch wide. Use "Minicel" as manufactured by Haveg Industries, Inc.; "Ethafoam SB" manufactured by Dow Corning; "Sonofoam" manufactured by Sonneborn; HBR manufactured by Hercules, Inc.; or equal.

2.05 BOND BREAKER

A. Pressure sensitive tape recommended by sealant manufacturer to suit application.

2.06 JOINT CLEANER

A. Noncorrosive and nonstaining type, recommended by sealant manufacturer; compatible with joint forming materials.

2.07 PRIMER

A. Non-staining type recommended by sealant manufacturer to suit application.

2.08 SEALANT COLOR

A. Unless specifically noted, sealant color shall generally match or complement the color of the principal material adjoining the area of application or as selected by Architect.

2.09 TAPE SEALANT

A. Closed cell polyvinyl chloride (PVC) foam, in black color, coated on both sides with a modified acrylic pressure-sensitive adhesive, in 3/4-inch width by length as required by sufficient thickness, as recommended by manufacturer, for particular application, meeting the following requirements:

1. Tensile Strength (ASTM D 412, Die C): 80 psi
2. Elongation (ASTM D 412, Die C): 125 percent

3. Compression Set (ASTM D 1056): 30 percent max
4. Compression Deflection (ASTM D 1056) at 25 percent Deflection: 2.5 psi
5. Low Temperature Flexibility, 5 hours at -40 degrees F: No cracking
6. Heat Resistance/Maximum Shrinkage, 70 hours at 212 degrees F: 1.5 percent
7. Staining (ASTM D 925) on Most Substrates: None
8. Water Absorption by Weight at 30 percent Compression: 24 percent
9. Density per Cubic Foot (ASTM D 3574) 10 pounds
10. Thermal Conductivity (k factor): 0.24

PART 3 - EXECUTION

3.01 GENERAL

A. Use of more than one material for the same joint is not allowed unless approved by the sealant manufacturer.

B. Install joint sealants in accordance with ASTM C962.

C. Sealants shall be self-leveling (S/L) for horizontal and sloping joints with a maximum slope of 1 percent. Non-sag sealants (N/S) shall be used for steeper sloped joints, vertical joints, and overhead joints. Immersible sealant may be used for non-immersible applications.

D. The one-part polysulfide (Type 8) and polyurethane (Types 5 and 6) and the acrylic (Type 9) sealants can be used in joints to maximum 1-inch width. Multi-part polyurethane (Types 2, 3, and 4) and polysulfide (Type 7) and silicone sealants can be used in joints to 2-inch maximum width. For joints wider than 2-inch, consult manufacturer for proper product application. Follow sealant manufacturer's recommendations.

E. Sealants used in water holding structures must be approved for use in domestic wastewater applications.

3.02 PREPARATION

A. Verify that joint dimensions, and physical and environmental conditions, are acceptable to receive sealant.

B. All surfaces to be sealed shall be clean, dry, sound, and free of dust, loose mortar, oil, and other foreign materials.

1. Mask adjacent surfaces where necessary to maintain neat edge.
2. Starting of work will be construed as acceptance of all sub-surfaces.

C. Verify that joint shaping materials and release tapes are compatible with sealant.

D. Examine joint dimensions and size materials to achieve required width/depth ratios.

E. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

F. Use bond breaker where recommended by sealant manufacturer.

3.03 MASTIC JOINT FILLER

A. Preformed joint filler shall be installed in accordance with manufacturer's specifications.

3.04 CAULKING AND SEALANT INSTALLATION

A. Install backup material as recommended by sealant manufacturer. Where possible, provide full length sections without splices.

B. Seal all joints around window, door, and louver frames; expansion joints; and elsewhere as indicated.

C. Apply all materials following manufacturer's recommendation and instructions, filling joint completely from back to top, without voids.

D. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.

E. Locate tape sealant where indicated on Drawings and install in strict accordance with manufacturer's instructions.

F. Drive caulking compound into the grooves with a caulking gun with sufficient pressure to force out air and to fill grooves solidly using a nozzle of proper size to fit width of grooves. Exposed surface of compound shall be tooled free of wrinkles and uniformly smooth. Leave all adjoining surfaces free of caulking material. Finish joints free of air pockets, foreign embedded matter, ridges, and sags.

3.05 CLEANING

A. Clean surfaces next to the sealed joints of smears or other soiling resultant of sealing application.

B. Replace any damaged surfaces resulting from joint sealing or cleaning activities.

3.06 APPLICATION SCHEDULE

A. This schedule lists the sealant types acceptable for each joint location. Use as few different sealant types as possible to meet the requirements of this project.

Joint Location	Sealant Type(s)
1. Expansion/Contraction and Control Joints at:	
Concrete Walls	1, 3, 4, 5, 6, 7
Concrete Floor Slabs	2,5
Masonry and Precast Walls	1, 3, 4, 5, 6, 7

Joint Location	Sealant Type(s)
2. Material Joints at:	
Metal Door, Window, and Louver Frames (Exterior)	1, 5, 6, 8
Metal Door, Window, and Louver Frames (Interior)	1, 5, 6, 8, 9
Wall Penetrations (Exterior)	1, 5, 6, 8
Wall Penetrations (Interior)	1, 5, 6, 8
Floor Penetrations	5, 6, 7
Ceiling/Roof Penetrations	1, 3, 4, 5, 6, 7
Sheet Metal Flashings	1, 3, 5, 7
3. Other Joints:	
Threshold Sealant Bed	5
Immersed Concrete (Vertical and Sloped)	3, 5
Immersed Concrete (Horizontal)	2, 5
Openings Around Pipes, Conduits, and Ducts Through Fire Rated Construction	11
Concrete Form Snap-Tie Holes	4,6
Between Counter Tops and Backsplashes	10
Around Plumbing Fixtures	10

END OF SECTION 07 90 00

DIVISION 8

OPENINGS

SECTION 08 11 00
STEEL DOORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes steel doors.

1.02 GENERAL REQUIREMENTS

A. See CONDITIONS OF THE CONTRACT and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 30 00, SUBMITTALS in Division 1, GENERAL REQUIREMENTS.

B. Submit the following:

1. Product data for each type of door specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles and finishes.

2. Shop Drawings showing fabrication and installation of steel doors. Include details of each frame type that the door interfaces with, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items as needed.

3. Door Schedule: Submit schedule of doors using same reference numbers for details and openings as those indicated.

4. Manufacturer’s certification that products meet or exceed specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors, cartoned or packaged, to prevent damage and deterioration.

1. Properly identify each item.

2. Provide cardboard, separators, banding, spreaders, and paper wrappings to protect units from damage during and after installation.

3. Replace damage units with new, undamaged units at no additional cost to the Owner.

B. Store doors upright, in protected dry area, at least 1-inch off ground or floor and at least 1/4-inch between individual pieces.

1. Follow special storage and handling requirements of manufacturer.

2. Protect exposed finish surfaces of prefinished items with masking tape.

1.05 QUALITY ASSURANCE

A. Comply with ANSI/SDI 100.

PART 2 - PRODUCTS

2.01 GENERAL

A. All steel doors shall be the products of one manufacturer and be compatible with the existing frames.

2.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, Inc.
2. Ceco Door Products.
3. Curries Co.
4. Fenestra Corp.
5. Kewanee Corp.
6. Republic Builders Products.
7. Approved equivalent.

2.03 DOOR MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569 (ASTM A 569M).

B. Cold-Rolled Steel Sheets: ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality.

C. Galvanized Steel Sheets: ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, with A 60 or G 60 (Z 180 or ZF 180) coating designation, mill phosphatized.

2.04 DOORS

A. General Requirements for All Doors and Frames:

1. Accessibility: Comply with ANSI A117.1.
2. Door Texture: Smooth faces.
3. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
4. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.05 STEEL DOORS

A. Grade: NAAMM HMMA 861, physical performance Level A.

B. Core: Polyurethane.

C. Top Closures for Doors: Flush with top of faces and edges, all seams welded and ground smooth.

D. Galvanizing: All components hot-dipped zinc-iron alloy-coated (Galvannealed), A60/ZF180.

E. Glazing Stops:

1. Minimum 0.0359-inch thick steel.

2. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass and other panels in doors.

3. Provide screw-applied, removable, glazing beads on inside of glass and other panels in doors.

F. Texture: Smooth faces.

G. Insulating Value: U-value of 0.1, when tested in accordance with ASTM C518.

H. Weatherstripping: Separate, see Section 08 71 00, DOOR HARDWARE.

I. Finish: Factory primed, for field finishing.

J. Schedule:

1. Lift Station Exterior Door

2. Package Plant Door(s)

2.06 ACCESSORY MATERIALS

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

2.07 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI A 250.3, manufacturer's standard coating of color as selected.

C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.08 HARDWARE

A. Hardware for doors and frames shall be as specified in Section 08 71 00, DOOR HARDWARE.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that doors are compatible with the existing frames. Doors that are not compatible with the existing frames shall be replaced at no additional cost to the Owner.

3.02 INSTALLATION

A. General: Install steel doors and accessories according to shop drawings, manufacturer's data, and as specified.

B. Grout all frames solid if the existing frames need new grout.

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

D. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

E. Protection Removal: Immediately before final inspection, remove protective wrappings from doors.

3.03 FIELD PAINTING

A. Where prime coat has been damaged, sand smooth and touch up with same primer as applied at shop.

1. Remove rust before painting.

2. Touch Up: Not obvious.

3. Perform immediately after door and frame installation.

B. Final paint coat shall be as specified in Section 09 90 00, PAINTING. Color shall be as indicated on the Drawings, or as selected by the Owner and Engineer from the Contractor provided shop drawings during the submittal phase.

3.04 PROTECTION

A. Protect installed doors and frames against damage from other construction work.

END OF SECTION 08 11 00

SECTION 08 34 83
FLOOR HATCHES AND PORTABLE HOIST

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section includes floor hatches, frames, lids, latches, lifting devices, locks, etc.

B. Related Requirements:

1. Section 03 60 000 – "Grout and Repair Mortar".
2. Section 07 11 00 – "Dampproofing".

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, dimensions materials, bearing strength or maximum weight, individual components and profiles, finishes and features.

B. Product Schedule: For all floor hatches and lifting device including:

1. Portable Hoist for Lift Station Wetwell

2. Access Hatches for Buried Concrete Tanks

1.04 CLOSEOUT SUBMITTALS

A. Record Documents: For all installed floor hatches, list of location, any departures from the Action Submittal.

1.05 QUALITY ASSURANCE

A. Door Inspector Qualifications: Inspector for field quality control inspections of door assemblies shall meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Rated Floor hatches: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency according to NFPA 288.

2.02 ALUMINUM FLOOR HATCHES

A. Angle Frame Aluminum Floor Hatch:

1. Frame: 1/4-inch aluminum with continuous anchor flange.
2. Door: Single leaf; 1/4-inch thick, diamond pattern mill-finish aluminum plate.
3. Loading Capacity: H-20 uniform live load.
4. Option Included: Odor gasket and Grating Panel
5. Hardware:
    a. Material and Finish: Type 316 stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and brackets, hinges, pins, and fasteners.
    b. Hinges: Type 316 stainless steel with tamper proof fasteners and stainless steel pins.
    c. Operating Mechanism: Adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with vinyl grip that allows for one-handed closure, and recessed lift handle.
    d. Latch: Stainless steel slam latch.
    e. Lock: Type 316 stainless steel slam lock with removable key or a recessed padlock hasp with cover.

B. Or approved equal.

2.03 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

E. Rolled-Stainless Steel Floor Plate: ASTM A793, manufacturer's standard finish.

F. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666. Remove tool and die marks and stretch lines, or blend into finish.

G. Stainless Steel Flat Bars: ASTM A666. Remove tool and die marks and stretch lines, or blend into finish.

H. Aluminum Extrusions: ASTM B221 Alloy 6063-T6.

I. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

J. Aluminum Sheet: ASTM B209 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

K. Frame Anchors: Same material as door face.

L. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.04 FABRICATION

A. General: Provide floor hatches manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure floor hatches to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.

2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that comes in contact with concrete.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

E. Prime Painted Steel: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

F. Stainless Steel Finish: Bright, cold-rolled, unpolished ASTM A480/A480M No. 2B finish.

2.06 MANUFACTURERS

A. Halliday or approved equal.

2.07 PORTABLE HOIST

A. The Portable Hoist supplied shall be manufactured by Halliday Products or approved equal.

B. The Portable Hoist shall be a Series DB Adjustable Reach Portable Hoist Model D1B36 and utilize an embedded series D1S hoist socket. The sockets shall be located to allow removal of both pumps. If the socket cannot be located to be able to remove both pumps from a single location the Contractor shall install a socket for each pump. Location to be approved by the Engineer.

C. The hoist shall be capable of lifting the pumps out of the wet-well for maintenance.

D. The Portable Hoist shall be equipped with the following standard features:

1. Type 304 stainless steel construction
2. Stainless Steel marine grade brake winch with 30 lineal feet of ¼" T-304 stainless steel cable with a stainless steel 1 ton safety hook. Hook shall be capable of connecting to the lifting chain for the pumps.
3. The davit arm shall adjust in 1inch increments from 24 to 36 inches and the overall unit height shall be 60 inches.
4. The Portable Hoist shall be guaranteed against defects in material and workmanship for a period of three (3) years.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing floor hatches.

B. Apply intumescent fireproofing to underside of floor hatch cover to minimum thickness required by intumescent fireproofing manufacturer for fire rating indicated.

3.03 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.04 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 34 83

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including general and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. The Contractor shall furnish all tools, equipment, materials, supplies and manufactured items, and shall perform all labor required to furnish and install, complete, finish hardware as indicated on the Drawings and specified herein.

B. Related Sections include the following:

1. Division 07 Section “Joint Sealants”.
2. Division 09 Sections for touchup, finishing or refinishing of existing openings modified by this section.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

1. Commercial Standards: Underwriter's Laboratories, Inc. requirements and approvals. Hardware Institute (DHI) Recommended Procedure for Processing Hardware Schedules and Templates and Architectural Hardware Scheduling and Format. BHMA Builders' Hardware Manufacturers' Association
2. Manufacturers' Standards: In addition to the standards listed above, the finish hardware and its installation shall be in accordance with the manufacturers' published recommendations and specifications.

1.04 SUBMITTALS

A. The following submittals and specific information shall be provided.

1. Manufacturer's information: The CONTRACTOR shall submit a complete detailed hardware list and a schedule along with manufacturer's literature on each item for approval. No hardware shall be delivered until the hardware schedule has been approved by the ENGINEER.
2. The hardware schedule submitted by the CONTRACTOR shall list the actual product series numbers. Manufacturer's catalog requirements for actual size of door closers, brackets, and holders shall be observed. All door sizes shall be noted on the hardware schedule and all hardware shall be in strict accordance with height, width, and thickness requirements.

3. The schedule shall indicate groups, type, manufacturer's name, catalog number, location, and finish of each item to be provided, all in accordance with the DHI "Architectural Hardware Scheduling Sequence and Format".

4. The schedule shall also include a complete template list showing template references and data for each item requiring preparation of metal doors and frames.

1.05 QUALITY ASSURANCE

A. Manufacturer's product names, numbers, and models are given herein for the purpose of indicating the requirements for the type, general construction, material and operation of the specific item, not with the intention of limiting the item to the manufacturer's listed product. Substitution of another manufacturer's product that is fully equivalent in all respects may be made subject to the approval of the ENGINEER. It shall be the CONTRACTOR's responsibility to supply detailed and complete data to the ENGINEER as required to facilitate appropriate evaluation of all proposed substitute items.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Except where otherwise specified all hardware shall be delivered to the jobsite.

B. Each unit of hardware specified herein shall be individually packaged complete with fastenings and all appurtenances. Each package shall be clearly marked on the outside to indicate its contents and its specific location in the work, and shall be identified by its related number from the reviewed hardware list.

C. Contractor shall store hardware in a safe place at the jobsite where directed by the ENGINEER to prevent loss or damage until installation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturer's product names, numbers and models given herein are for the purpose of indicating the basic requirements for type, construction, material, operation, durability and functional adequacy of the specific item. Substitution of another manufacturer's product that is fully equivalent in all respects will be made subject to the approval of the ENGINEER.

B. Provide end products of one manufacturer for each item in order to achieve standardization for appearance, maintenance, and replacement.

C. When deemed necessary for product evaluation prior to review, the ENGINEER may require submittal of full size standard production units for inspection and check. Such samples will be returned to the Contractor and may be installed on the project if identified for location in conformance with specified requirements.

D. Contractor shall check kinds and quantities of hardware products to determine conditions, completeness, and conformance to the Specifications.

2.02 PRODUCT TYPES

A. Locks and Latches: All locks shall be mortise-style, security type with stainless steel mechanism for all exterior insulated metal doors.

1. Lock sets shall be commercial grade manufactured by Schlage or approved equal.

B. Lock Uniformity: Except as otherwise specified, Contractor shall furnish locksets, cylinders, and component parts as hereinbefore specified, by one manufacturer.

C. Lock Strikes: Shall be boxed type with curved tip of sufficient length to protect trim and/or jamb. Lock strikes shall be delivered to the jobsite with the locksets.

D. Fasteners: Bolts, screws, fittings, and other fasteners, including soffit plates for door closers, shall be provided for proper and secure attachment with specified hardware.

E. Door Closers (N/A).

F. Door Swings: Door swings indicated on the Contract drawings are standard door swings. If a door hand is changed during Construction the Contractor shall make necessary changes in hardware at no additional expense to the Owner, subject to the approval of the ENGINEER.

G. Door Butts shall be of proper width to clear trim and other features when door swings to 180 degrees and shall have oil-impregnated ball bearings.

1. Door 1-3/4-inch thick up to 7-feet 0-inch to have 1-1/2 pair of 4-1/2-inch X 4-1/2-inch butts.

2. Exterior doors to have butts with oil-impregnated bearings.

3. Provide template hinges for use on metal door frames.

H. Kickplates: 16-gauge stainless steel with edges beveled four (4) sides. Kickplates to be 10- inches high x door width less 1-inch.

I. Lock Astragal: Provide astragal for exterior in swinging 1-3/4-inch metal doors, of 9-3/8-inch x 1- 1/2-inch size with US 10 finish designed to prevent tampering of lock bolts from the exterior.

J. Flush Extension Bolt: Two point concealed automatic type for exit operation only with control knob located on the inside, provided with top and bottom strikes, Underwriters Laboratories (UL) Listed, bronze components with 626 finish and designed for use on 1-3/4-inch thick hollow metal doors.

K. Bumpers: Bumpers shall be wall-mounted on all interior doors swinging into a wall or partition. Floor or slab mounted bumpers shall be provided on exterior doors to prevent door swing beyond 120 degrees or to point 4” before obstruction.

L. Threshold: Threshold shall be sized to match the door. Extruded aluminum alloy 6063 T5.

2.03 FINISHES

A. All finishes hereinafter specified are "BHMA" numbers as specified by the "Building Hardware Manufacturer's Association".

1. 600 - Prime Coat

2. 626 - Dull Chromium

3. 629 - Bright Stainless Steel

4. 630 - Satin Stainless Steel

B. All items not specified herein shall have BHMA 630 finish.

C. Locksets and Deadlocks shall have BHMA 630 finish.

D. All hinges to have BHMA 630 finish

E. Kickplates, Push and Pulls to have BHMA 630 finish.

F. Closer cover plates to have dull bronze lacquer finish.

G. Miscellaneous Finishes shall be as specified.

2.04 KEYING

A. All locksets shall be keyed alike and CONTRACTOR shall furnish three (3) keys for each lock, or a total of ten (10) keys, whichever is less.

B. The Contractor shall work with the Owner upon substantial completion for the Owner to key the locks.

2.05 HARDWARE SCHEDULE

A. The following hardware schedule is intended to represent the hardware required. Provide the following hardware or their equal:

Door Opening	**Hardware**	**No. Each Door**
Exterior Doors	Butts	3
	Lockset	1
	Closer	0
	Threshold	1 (as needed for ex. opening)
	Drip Cap	0
	Kickplates	2
	Bumpers	1
Interior Door	Butts	3
	Lockset	0
	Closer	0
	Kickplates	2
	Bumper	1

2.06 TEMPLATES

A. All hardware for metal doors and metal frames shall be fabricated to template. Templates, or physical hardware items, shall be furnished sufficiently in advance to avoid any work delay.

PART 3 - EXECUTION

3.01 GENERAL

A. Prior to completion of construction, and after final installation of hardware, the CONTRACTOR shall demonstrate to the ENGINEER that all items of operable hardware function properly, that doors swing smoothly, and that keys lock and unlock their respective doors.

B. The CONTRACTOR, upon completion of the work herein, shall remove all oil, grease, or other soiling from exposed surfaces of finish hardware and shall remove all cartons, wrappings, and other debris resulting from the work herein, and shall leave the facility in a neat, clean, and acceptable condition subject to approval by the ENGINEER.

C. The Contractor shall verify compatibility with the existing frames prior to ordering hardware. If the hardware is not compatible with the existing frames the hardware shall be replaced at no additional cost to the Owner.

3.02 INSTALLATION

A. All hardware shall be installed accurately and in accordance with manufacturer's instructions.

B. Hardware shall be securely tightened to develop full strength of components and provide for proper operation.

C. Make work neat and secure.

D. Prevent marring, scratching, or otherwise damaging adjacent finishes during hardware installation.

E. Latchbolts:

1. Install to engage in strikes automatically, whether activated by closers or manually.

2. Additional manual pressure shall not be required to engage latchbolt in strike.

F. Stops and Holders: Set to allow doors to open as far as possible.

G. Wall Mounted Hardware: Install over solid structural backing or solid blocking in hollow walls.

H. Thresholds:

1. Cope ends neatly to profile of jamb.

2. Set in sealant and seal ends to jambs.

3. Where fastened to concrete, anchors shall be 5/16 stainless steel flat head countersunk machine screws anchors spaced at 6 inches on center. Thresholds shall be set in mastic conforming with Fed Spec SS-C-153.

I. Hardware: Adjust for easy, noise-free operation.

J. Replace damaged hardware items.

3.03 PROTECTION

A. Cover and protect exposed surfaces of hardware during installation and until substantial completion.

B. Fit, dismantle, and reinstall finish hardware as required for finish painting work.

C. Protect and prevent staining of hardware during construction in accordance with manufacturer's recommendations.

D. Remove protective measures on permanent lock cylinders installed prior to final cleaning.

END OF SECTION 08 71 00

DIVISION 9

FINISHES, PAINT & COATINGS

SECTION 09 06 00
SCHEDULES FOR FINISHES

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submittal requirements are specified in appropriate product sections.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products and materials referred to in this section are specified in appropriate product sections.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Requirements for incorporation of scheduled products into the Work are specified in appropriate product sections.

B. Architectural painting and coating schedules are depicted on the Drawings.

C. In the event schedules for painting and coating systems conflict, the requirements for High Performance Painting and Coating shall govern.

D. Paint exposed surface whether or not painting system is designated in “schedules”, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If coating system is not designated, the Engineer will select from coating systems available.

3.02 SUPPLEMENTS

A. The supplements listed below, are a part of this Specification.

1. High Performance Coating System Schedule: A tabulation of coating systems for equipment and areas as depicted on the Drawings.

High Performance Painting & Coating Schedule

Building	Space	Material or Surface	Coating System	Specification
Lift Station Building	All Spaces	Precast Walls	Section 2.08	09 90 00
		Precast Ceiling	Section 2.08	09 90 00
		Floors	Section 2.07	09 90 00
		Cast-in-Place Concrete, High H_2S Exposure	System 11	09 90 02
		Precast Concrete, Immersion and High H_2S Exposure	System 11	09 90 02
		Concrete Pedestals & Mounting	System 13	09 90 02
		Ferrous Metals	System 4	09 90 02
		Metals, Concrete Embedded	System 6	09 90 02
		PVC, CPVC, and FRP	System 8	09 90 02
		Process Piping	System 4	09 90 02
		Galvanized, Copper, Nonferrous Alloys	System 7	09 90 02
Manhole Structures	All Spaces	Walls	System 11	09 90 02
		Floor	System 11	09 90 02
		Ceiling	System 11	09 90 02
		Ferrous Metals	System 4	09 90 02
		Process Pipe	System 4	09 90 02
Treatment Basins (Buried Tanks)	All Spaces	Walls	System 11	09 90 02
		Floors	System 11	09 90 02
		Ceilings	System 11	09 90 02
		Ferrous Metals	System 4	09 90 02
		Metals, Concrete embedded	System 6	09 90 02
		Process Pipe	System 4	09 90 02
		PVC, CPVC, and FRP	System 8	09 90 02
		Concrete Pipe Supports & Penetrations	System 11	09 90 02

END OF SECTION 09 06 00

SECTION 09 90 00
PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes surface preparation and field application and finishing of exposed interior and exterior items and surfaces.

B. Related Divisions:

1. Division 3 – Concrete and Grout
2. Division 4 – Masonry
3. Division 5 – Metals
4. Division 6 – Woods, Plastics, Composites
5. Division 7 – Thermal & Moisture Protection
6. Division 11 – Equipment
7. Division 40 – Process Interconnections

1.02 REFERENCES

A. American Society for Testing and Materials:

1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

B. Painting and Decorating Contractors of America:

1. PDCA - Architectural Painting Specification Manual.

C. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on finishing products.

C. Manufacturer's Installation Instructions: Submit special surface preparation procedures and substrate conditions requiring special attention.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of

painted and coated surfaces.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Paint Materials: Store at minimum ambient temperature of 45°F and maximum of 90°F, in ventilated area, and as required by manufacturer's instructions.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and oil based Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candle measured mid-height at substrate surface in order to assure proper visual quality assurance.

1.09 SEQUENCING

A. Section 01 11 00 - Summary: Work sequence.

B. Sequence application to the following:

1. Do not apply finish coats until paintable sealant is applied.

2. Back prime wood trim before installation of trim.

1.10 WARRANTY

A. Furnish five year manufacturer warranty for paints and coatings.

1.11 EXTRA MATERIALS

A. Supply 1 gallon of each color, type, and surface texture; store where directed.

B. Label each container with color, type, texture and room locations in addition to manufacturer's label.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide Products (Paint, Primer, Sealers and Block Fillers) as manufactured by:

1. Sherwin Williams (SW)
2. Benjamin Moore & Co.;
3. PPG Industries;
4. Tnemec Company, Inc;
5. Glidden Professional.
6. Columbia Paints.

B. Listing of products by manufacturer’s trade name is not intended to exclude equivalent products by other manufacturers identified above. For products not specifically named, submit substitution request in accordance with Section 01 60 00.

2.02 FILLERS AND SEALERS

A. Interior Block Filler:

1. Benjamin Moore and Company: Super Craft Block Filler No. 285
2. PPG Industries, Inc.: Speedhide Acrylic Latex Masonry Block Filler, 6-7.
3. Sherwin-Williams: Interior/Exterior Block Filler No. B25W25.
4. Tnemec Company, Inc.: Latex Masonry Filler No. 54-560.

B. Single Component Masonry Conditioner:

1. Benjamin Moore: Acrylic Masonry Sealer (066)
2. PPG Industries, Inc.: Masonry Surface Sealer No. 6-8.
3. Sherwin-Williams: Loxon Masonry Conditioner A24

C. Paste Wood Filler:

1. Benjamin Moore and Company: Benwood Wood Filler #238
2. Sherwin-Williams: Sherwood Wood Filler.

D. Sanding Sealer (Vinyl Toluene Copolymer):

1. Benjamin Moore and Company: IWF Sanding Sealer Clear No. 413.
2. PPG Industries, Inc.: Speedhide Alkyd Sanding Sealer, 6-10.
3. Sherwin-Williams: Wood Classics Fast Dry Sanding Sealer.

E. Stain Sealer:

1. Benjamin Moore and Company: Moore's Stain Blocking Primer No 202.
2. Sherwin-Williams: Preprite Problock Latex & Alkyd Primer/Sealer

2.03 PRIME COATINGS

A. Exterior Alkali Resistant Primer:

1. Benjamin Moore and Company: Super Spec Exterior Latex Primer No. 169
2. PPG Industries, Inc.: Alkali Resistant Primer No. 6-3.
3. Sherwin-Williams: Loxon Exterior Masonry Primer A24 Series

B. Interior Alkyd Enamel Undercoater:

1. Benjamin Moore and Company: Super Spec Alkyd Enamel Undercoater C245
2. PPG Industries, Inc.: Speedhide Quick Drying Enamel Undercoater, 6-6.
3. Sherwin-Williams: Wall and Wood Primer B49WZ2.

C. Alkyd-Phenolic Primer:

1. Benjamin Moore: M07 Universal Metal Primer
2. PPG Industries, Inc.: Multiprime Universal Primer No. 97-682.
3. Sherwin-Williams: Ken Kromik Universal B50NZ Series.
4. Tnemec Company, Inc.: Series 37 Chem-Prime.

D. Etching Metal Primer:

1. PPG Industries, Inc.: Polyclutch Wash Primer No. 97-687.
2. Sherwin-Williams: DTM Wash Primer B71Y1.
3. Tnemec Company, Inc.: Tneme-Grip No. 32-1210.

E. Ethyl Silicate Zinc Primer:

1. Benjamin Moore: M01/M02 Inorganic Zinc Primer
2. PPG Industries, Inc.: Metalhide 1001 Inorganic Zinc Rich Primer, 97-673/97-674.
3. Sherwin-Williams: Zinc Clad II HS Ethyl Silicate B69BVZ3.
4. Tnemec Company, Inc.: Tneme-Zinc No. N90E92.

F. Acrylic Latex Ferrous Metal Primer:

1. Benjamin Moore: Acrylic Metal Primer M04.
2. Sherwin Williams: Pro Cryl Universal Metal Primer B66W310.

G. Exterior Alkyd Primer:

1. Benjamin Moore and Company: Super Spec Alkyd Exterior Primer No. 176.

2. PPG Industries, Inc.: Speedhide Exterior Alkyd Wood Primer, 6-9.
3. Sherwin-Williams: A-100 Exterior Wood Primer Y24.
4. Tnemec Company, Inc.: Undercoater No. 36-603.

H. Galvanized Primer:
1. Benjamin Moore: Acrylic Metal Primer M04
2. PPG Industries, Inc.: Galvanized Steel Primer No. 6-209.
3. Sherwin-Williams: Galvite HS B50WZ30.
4. Tnemec Company, Inc.: Galv-Gard Series 22.

I. Latex Primer:Interior
1. Benjamin Moore: Super Spec Primer Sealer & Latex Undercoat No 253.
2. PPG Industries, Inc.: Speedhide Latex Wall Sealer No. 6-2.
3. Sherwin-Williams: PrepRite Primer B28W200.
4. Tnemec Company, Inc.: PVA Sealer No. 51-792.

J. Latex Primer Exterior :
1. Benjamin Moore: Super Spec Latex Exterior Primer No. 169.
2. Sherwin Williams; A-100 Latex Primer B42W41.

K. Long-Oil Alkyd Primer:
1. Benjamin Moore: Moorwhite Penetrating Alkyd Primer No. 100.
2. PPG Industries, Inc.: Speedhide Alkyd Red Rust Inhibitive Steel Primer, 6-208.
3. Sherwin-Williams: Kromik Metal Primer E41N1.
4. Tnemec Company, Inc.: Tnemec Primer Series 10.

2.04 WATER REDUCIBLE COATINGS

A. Industrial 100% Acrylic:
1. Benjamin Moore: DTM Acrylic Gloss (M28) or Semi-Gloss (M29).
2. PPG Industries, Inc.: Water Base Inhibitive Primer No. 6-712.
3. Sherwin-Williams: DTM Acrylic.
a. Gloss: B66-100.
b. Semi-Gloss: B66-200.
4. Tnemec Company, Inc.: Tneme-Cryl Series 6 (Flat) and Series 7 (Semi-gloss).

B. Interior Premium Acrylic Latex Enamel:
1. Benjamin Moore and Company:

a. Eggshell: Super Spec Latex Eggshell Enamel (286).

b. Pearl Finish:: Super Sec Latex Pearl Finish (277).

c. Semi-Gloss: Super Spec Latex Semi-Gloss Enamel (283).

d. Gloss: Impervex Metal & Wood Enamel no. 309.

2. PPG Industries, Inc.:

a. Eggshell: Speedhide Acrylic Latex Enamel, 6-411.

b. Semi-Gloss: Speedhide Acrylic Latex Enamel, 6-510.

3. Sherwin-Williams:

a. Eggshell: ProMar 200 EgShel B20W200.

b. Semi-Gloss: Pro Mar 200 Latex Semi Gloss B31 Series.

c. Gloss: Pro Classic Gloss B21.

C. Interior Acrylic Vinyl Latex Flat Paint:

1. Benjamin Moore and Company: Super Spec Latex Flat (275).

2. PPG Industries, Inc.: Speedhide Acrylic Latex Flat Wall Paint, 6-70.

3. Sherwin-Williams: ProMar 200 Flat B30W200.

D. Water Based Epoxy:

1. Benjamin Moore and Company: Super Spec Acrylic Epoxy Enamel No. 256.

2. PPG Industries, Inc.: Pitt-Glaze Water Based Acrylic Epoxy Enamel.

3. Sherwin Williams: Water Based Epoxy B70-200.

2.05 WOOD STAINS AND COATINGS

A. Masking Wiping Stain:

1. Benjamin Moore and Company: Benwood Interior Stain No. 234.

2. PPG Industries, Inc.: Rez Interior Stain No. 77-302.

3. Sherwin-Williams: Wood Classics A49-200.

B. Non-Masking Penetrating Stain:

1. Sherwin-Williams: Sherwood S64.

C. Alkyd Polyurethane Varnish:

1. Benjamin Moore and Company: Benwood Polyurethane Finishes No.424 (Flat), 435 (Satin), and 428 (Gloss).

2. PPG Industries, Inc.: Rez Polyurethane Varnish No. 77-9 (Satin), 77-5 (Gloss).

3. Sherwin-Williams: Wood Classics Polyurethane Varnish A67 Series.

4. Minwax® Wipe-On Poly.

D. Semi-Transparent Stain:

1. Benjamin Moore and Company: Benjamin Moore Alkyd Semi-Transparent Stain No. 328.
2. PPG Industries, Inc.: Rez Stain Wood Preservative & Water Repellant Stain No. 77-860.
3. Sherwin-Williams: WoodScapes Semi-Transparent Stain A15T5.

E. Spar Varnish:

1. Benjamin Moore and Company: Impervo 440 Spar Varnish.
2. PPG Industries, Inc.: Rez Spar Varnish No. 77-10.
3. Sherwin-Williams: Helmsman /Minwax Spar Varnish.

2.06 ACCESSORY MATERIALS

A. Muriatic acid, mildewcide, TSP (tri-sodium phosphate), acidic-detergent, zinc sulfate, sodium metasilicate, and solvent: Commercially available, non-damaging to surface being cleaned; as specified in PDCA Specification Manual; acceptable to coating manufacturer.

B. Metal Conditioner: Proprietary phosphoric acid based, etching type solution; acceptable to coating manufacturer.

C. Rust Inhibitor: Water containing 0.32 percent of sodium nitrite and 1.28 percent by weight of secondary ammonium phosphate (dibasic); or water containing 0.2 percent by weight of chromic acid or sodium chromate or sodium dichromate or potassium dichromate.

D. Spackling compound, putty, plastic wood filler, liquid de-glosser, latex patching plaster, latex base filler, thinners, and other materials not specifically indicated but required to achieve finishes specified: Pure, of highest commercial quality, compatible with coatings and acceptable to coating manufacturer.

E. Do not use products of different manufacturers in combination.

2.07 CONCRETE FLOOR SEALER (SC)

A. Manufacturers

1. H & C Concrete Sealer Wet – Look Water Based (Basis of Design)
2. Substitutions: Per Section 01 61 00 – Product Requirements.

B. Products

1. 100% Clear Acrylic Sealer
2. Slip Resistant Additive
    a. H & C Shark Grip

C. Installation: Per manufacturer’s instructions.

2.08 CONCRETE WALL SEALER

A. Manufacturers:

1. Sika Corporation: Sikagard 62 Epoxy Coating.

a. 2-component, 100% solids, moisture-tolerant epoxy resin.

b. High-build, protective, dampproofing and waterproofing vapor- barrier system

2. Substitutions: Per Section 01 61 00 – Product Requirements.

2.09 BLOCK FILLER

A. Manufacturers

1. Sherwin Williams, Prep Rite.

2. Substitutions: Per Section 01 61 00 – Product Requirements.

2.10 MIXING

A. Use factory prepared colors matching approved samples. Site tinting will not be permitted.

B. Thoroughly mix and stir coatings before use to ensure homogeneous dispersion of ingredients. Prior to application, blend multiple containers of same material and color by pouring from one container to another several times to ensure uniform consistency, color, and smoothness.

C. Mix only in clean mixing pails of material recommended by manufacturer to avoid contamination.

D. Remove film which may form on surface of material in containers and strain material before using. Stir frequently during use to maintain pigments in suspension. Do not stir film into material.

E. Apply coatings of consistency recommended by manufacturer. Thin only within recommended limits using thinners approved by coating manufacturer.

2.11 COLORS AND FINISHES

A. Refer to the Painting & Coating Schedule at the end of this Section and also on the Project Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution Requirements: Coordination and project conditions.

B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of substrates using recently calibrated electronic moisture meter. Do not apply coatings if moisture content of surfaces exceeds lesser of percentages listed below or those required by coating manufacturer. If excess moisture content exists and cannot be reduced, obtain written approval of coating manufacturer before application of coatings.

1. Gypsum board and gypsum plaster: 17 percent.
2. Architectural woodwork, trim, cabinets, and casework: 10 percent; measure with resistance-type meter in accordance with ASTM D4442.
3. Common board and dimension lumber: 12 percent; measure with resistance-type meter in accordance with ASTM D4442.
4. Masonry, concrete, CMU, and Portland cement plaster: 17 percent for solvent reduced coatings. Test concrete floors in accordance with ASTM D4263.
5. Canvas and cotton insulation coverings: 12 percent max.
6. Concrete Floors: 8 percent.

3.02 PREPARATION

A. Protect completed construction from damage. Furnish drop cloths, shields, and protective methods to prevent spray, splatter, or droppings from disfiguring other surfaces.

B. Remove surface hardware, mechanical diffusers, escutcheons, registers, electrical plates, light fixture trim, fittings, fastenings and similar items prior to preparing surfaces for finishing. Provide surface-applied protective masking for non-removable items. Carefully store removed items for reinstallation.

C. Remove mildew by scrubbing with mildewcide. Rinse thoroughly with clean water and allow surface to dry completely.

D. Before beginning application of coatings, ensure surfaces are clean, dry, and free of dirt, dust, rust or rust scale, oil, grease, mold, mildew, algae, efflorescence, release agents, or any other foreign material which could adversely affect coating adhesion or finished appearance.

E. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

F. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

G. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.03 SURFACE PREPARATION FOR NEW WORK

A. General:

1. Correct minor defects.
2. Remove temporary labels, wrappings, and protective coverings from surfaces to be coated.
3. Seal stains, marks, and other imperfections which may bleed through surface finishes.

B. Aluminum:

1. Clean in accordance with SSPC SP1 "Solvent Cleaning".
2. Apply etching type primer.

C. Concrete:

1. Prior to application of coatings, allow surfaces to cure minimum 60 days.
2. Remove dirt, scale, powder, laitance, and bond breakers by light sandblasting to minimum 1.5 mil profile.
3. Remove oil and grease with solution of TSP; rinse well.
4. Remove stains caused by weathering or corroding metals with solution of sodium metasilicate applied after thoroughly wetting surface with potable water; allow to dry.
5. Fill cracks and voids with compatible filler.
6. Brush-off blast floors to lightly abrade surface without entirely removing surface or exposing underlying aggregate.

D. Gypsum Board:

1. Fill remaining cracks, depressions, holes and other irregularities with spackling compound.
2. Sand rough or high spots left by joint cement or spackling compound without damaging paper face.
3. Remove dust by wiping with damp cloths and vacuuming.

E. Masonry:

1. Prior to application of coatings, allow surfaces to cure minimum 28 days.
2. Remove dirt, scale, loose mortar, efflorescence, and powder by wire brushing or by other approved methods.
3. Remove oil and grease with solution of TSP, rinse, and allow to dry.
4. Remove stains caused by weathering or corroding metals with solution of sodium metasilicate applied after thoroughly wetting surface with potable water; allow to dry.

5. Wash and neutralize surfaces as recommended by coating manufacturer, rinse, and allow to dry.

F. Existing and New Plaster (or stucco) :

1. Allow surfaces to cure and dry completely prior to application of coatings; minimum of 28 days.
2. Remove dirt, efflorescence, scale, loose sand, and powder by wire brushing or by other approved methods.
3. Remove oil and grease with solution of TSP, rinse, and allow to dry.
4. Wash portland cement plaster to receive solvent reducible coatings with zinc sulfate solution, rinse, and allow to dry.
5. Wash gypsum plaster to receive solvent reducible coatings with acidic-detergent, rinse and allow to dry.
6. Fill hairline cracks, small holes and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces.

G. Steel - Uncoated:

1. Remove weld spatter by chipping or grinding.
2. Clean interior and weather protected steel in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning". Clean areas of excessive corrosion or scale in accordance with SSPC SP7 "Brush-Off Blast Cleaning".
3. Clean exterior steel permanently exposed to elements in accordance with SSPC SP6 "Commercial Blast Cleaning".
4. Apply metal conditioner to bare surfaces in accordance with manufacturer's recommendations, paying particular attention to abrasions, welds, bolts, and nuts. Allow to set as recommended by solution manufacturer. Rinse with clean water with rust inhibitor mixed with water or applied immediately following rinse. Allow to dry.
5. Prime coat immediately.

H. Steel - Prime Coated:

1. Remove loose primer and rust to feather-edge at adjacent sound primer by cleaning in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning".
2. Apply metal conditioner to abrasions, welds, bolts, and nuts in accordance with manufacturer's recommendations. Allow to set as recommended by manufacturer. Rinse with clean water with rust inhibitor mixed with water or applied immediately following rinse. Allow to dry.
3. Prime coat bare areas immediately.

I. Steel - Galvanized:

1. Remove white rust by cleaning in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning". Exercise care not to remove galvanizing.

2. Pretreat surfaces to receive solvent reducible coatings immediately.

J. Wood - Opaque Finish:

1. Remove excess residue from knots, pitch streaks, cracks, open joints, and sappy spots. Remove or seal over grade stamp markings.

2. Sand wood surfaces and edges smooth. Remove dust after each sanding.

3. Apply compatible stain sealer to knots, pitch and resinous sapwood before applying prime coat. Do not apply shellac to exterior surfaces, or under latex or urethane finishes.

4. After primer is dry and before second coat, countersink nails and fill nail holes, cracks, open joints and other defects with putty or plastic wood filler.

K. Wood - Transparent Finish:

1. Remove excess residue from knots, pitch streaks, cracks, open joints, and sappy spots. Ensure exposed fasteners are countersunk.

2. Sand wood surfaces and edges smooth. Remove dust after each sanding.

3. After stain is dry and before sanding sealers are applied, fill nail holes, cracks, open joints and other defects with putty or plastic wood filler.

4. Tint fillers to match stain and finish coatings. Work fillers well into and perpendicular to grain before set. Wipe excess from surface.

3.04 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:

1. Remove cracked and deteriorated sealants and calking.

2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.

3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.

4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.

5. Remove mildew as specified above.

6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, request recommendation from Architect.

7. Apply specified primer to surfaces scheduled to receive coatings.

B. Concrete, Masonry, and Portland Cement Plaster:

1. Fill cracks and voids with latex base filler.
2. Apply masonry conditioner to masonry surfaces in accordance with manufacturer's instructions.
3. Apply primer over bare surfaces and filler material.

C. Gypsum Wallboard and Gypsum Plaster:

1. Fill cracks and voids with spackling compound.
2. Apply primer over bare surfaces and newly applied texture coatings.

D. Metal:

1. Remove rust from surfaces to bare metal in accordance with SSPC SP6 "Commercial Blast Cleaning".
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

E. Wood:

1. Fill cracks, crevices and nail holes with putty or wood filler.
2. Apply primer over bare surfaces and filler material.

3.05 APPLICATION

A. General Requirements:

1. Coat all surfaces specified, scheduled, illustrated, and otherwise exposed unless specifically noted otherwise.
2. Apply coatings of type, color, and sheen as scheduled.
3. Use application materials, equipment, and techniques as recommended by coating manufacturer and best suited for substrate and type of material being applied.
4. Do not apply finishes to surfaces that are improperly prepared.
5. Number of coats specified are minimum number acceptable.
6. Apply coating systems to total dry film thickness scheduled. Apply material at not less than manufacturer's recommended spreading rate. Do not exceed maximum single coat thickness recommended by coating manufacturer. Do not double-back with spray equipment building up film thickness of two coats in one pass.
7. Ensure that edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent of flat surfaces.
8. Finish edges of coatings adjoining other materials or colors sharp and clean, without overlapping.

B. Prime Coats:

1. Apply initial coat to surfaces as soon as practical after preparation and before subsequent surface deterioration.
2. Backprime exterior woodwork with specified primer.
3. Backprime interior woodwork scheduled to receive transparent finish with gloss varnish reduced 25 percent with mineral spirits.
4. Apply primer to wood and metal sash before field glazing.

C. Intermediate and Top Coats:

1. Allow previously applied coat to dry before next coat is applied.
2. Sand and dust lightly between coats as recommended by coating manufacturer.
3. Apply each coat to achieve uniform finish, color, appearance, and coverage free of brush and roller marks, runs, misses, visible laps or shadows, hazing, bubbles, pin holes, or other defects.
4. If stains, undercoats, or other conditions show through final topcoat, correct defects and apply additional topcoats until coating film is of uniform finish, color, and appearance.

D. Finish Matching:

1. Finish closets same as adjoining rooms, unless otherwise specified.
2. Finish tops, bottoms, and edges of doors same as door faces. Apply sanding sealer to cut-outs. When faces are different colors, finish edges of doors to match space from which they are visible when door is in partly open position.
3. Finish other surfaces not specifically mentioned to match adjoining surfaces.

E. Mechanical and Electrical Items:

1. Refer to Division 21 – Fire Suppression, Division 22 – Plumbing, Division 23 - Heating, Ventilating, and Air Conditioning, and Division 26 - Electrical for schedule of color coding and identification banding of equipment, ductwork, piping, and conduit. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated.
2. Prior to finishing mechanical and electrical items, remove louvers, grilles, covers, and access panels and finish separately. Replace when dry.
3. Paint interior surfaces of ducts, and heating cabinets that are visible or reflective behind grilles and registers with one coat of flat black paint.
4. Finish dampers visible behind grilles and registers to match surface finish.
5. Paint both sides and edges of plywood equipment backboards before installing equipment.
6. Do not apply coatings over name plates, tags, or other equipment identification.

F. Reinstall trim, fittings, and other items removed for finishing.

3.06 FIELD QUALITY CONTROL

A. General: Comply with requirements of Section 01 40 00.

B. Periodically test film thickness of each coat with wet film gage to ensure coatings are being applied to proper thickness.

C. Request review of each applied coat by Architect before application of successive coats. Only reviewed coats will be considered in determining number of coats applied.

D. Immediately prior to Substantial Completion, perform detailed inspection of painted surfaces and repair or refinish abraded, stained, or otherwise disfigured surfaces.

E. Testing: Owner reserves right to employ independent testing agency to verify acceptability of substrates and conformance of coating materials to specified requirements; and to test coating quality and dry film thickness.

F. If test results show that material does not comply with specified requirements, remove noncomplying coatings, recoat with acceptable material, and pay costs of additional testing to ensure compliance.

3.07 CLEANING

A. Promptly remove spilled, splashed, or spattered coatings. Clean spots, oil, and other soiling from finished surfaces using cleaning agents and methods which will not damage materials.

B. If completed construction is damaged beyond normal cleaning or repair by painting operations, replace damaged items at no additional cost to Owner.

C. Maintain premises and storage areas free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

D. Collect waste, cloths, and material which may constitute fire hazards and place in closed metal containers; remove from site daily along with empty containers.

3.08 PROTECTION

A. Protect finished work in accordance with Section 01 70 00.

B. Protect work of other trades against damage from coating activities. Correct damage by cleaning, repairing, replacing, and recoating as acceptable to Architect.

C. Provide "Wet Paint" signs and other methods to protect newly coated surfaces. Remove when directed or when no longer needed.

3.09 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

A. Exposed surfaces of lintels, Hollow metal frames units, and miscellaneous exposed steel construction.

3.10 SCHEDULE - EXTERIOR COATING SYSTEMS

A. Metal Surfaces:

1. Non-Ferrous Metals and Zinc-Coated (Galvanized) Steel

a. System Latex Finish:

Sheen: Semi-Gloss.

Prime Coat: Galvanized Primer at 2.0 mils.

Under Coat: Industrial Acrylic at 3.0 mils.

Top Coat: Industrial Acrylic at 3.0 mils.

System DFT: 8.0 mils.

2. Ferrous Metals – Uncoated:

a. System Latex Finish:

Sheen: Semi-Gloss.

Prime Coat: Alkyd-Phenolic Primer at 2.5 mils.

Under Coat: Industrial Acrylic at 2.5 mils.

Top Coat: Industrial Acrylic at 2.5 mils.

System DFT: 7.5 mils.

3. Ferrous Metals - Previously Coated:

a. Coating System Latex Finish:

Sheen: Semi-Gloss.

Prime Coat: Touch-up existing with compatible primer.

Under Coat: Industrial Acrylic at 2.5 mils.

Top Coat: Industrial Acrylic at 2.5 mils.

System DFT: 5.0 mils (excluding existing and touch-up primer).

3.11 SCHEDULE - INTERIOR COATING SYSTEMS

A. Concrete and Masonry Surfaces

1. Concrete Masonry Units:

a. System Latex Finish:

Sheen: Satin.

Prime Coat: Interior Block Filler at 11.0 mils.

Under Coat: Interior Latex Enamel at 1.5 mils.

Top Coat: Interior Latex Enamel at 1.5 mils.

System DFT: 3.0 mils (excluding primer).

b. System Alkyd Finish:

Sheen: Satin.

Prime Coat: Interior Block Filler at 11.0 mils.

Under Coat: Interior Alkyd Enamel at 1.7 mils.

Top Coat: Interior Alkyd Enamel at 1.7 mils.

System DFT: 3.4 mils (excluding primer).

2. Metal Surfaces:
   a. Non-Ferrous Metals and Zinc-Coated (Galvanized) Steel:
      i. System Latex Finish:

         Sheen: Satin.

         Prime Coat: Galvanized Primer at 2.0 mils.

         Under Coat: Interior Latex Enamel at 1.5 mils.

         Top Coat: Interior Latex Enamel at 1.5 mils.

         System DFT: 5.0 mils
   b. Exposed Interior Structural Steel - Uncoated:
      i. System Latex Finish:

         Sheen: Satin.

         Prime Coat: Waterbased Ferrous Metal Primer

         Under Coat: Waterbased Polyurethane Acrylic at 1.5 mils.

         Top Coat: Polyurethane Clear Coat at 1.5 mils.

         System DFT: 5.0 mils.
   c. Ferrous Metals - Uncoated:
      i. System Latex Finish:

         Sheen: Satin.

         Prime Coat: Acrylic Latex Ferrous Metal Primer

         Under Coat: Interior Latex Enamel at 1.5 mils.

         Top Coat: Interior Latex Enamel at 1.5 mils.

         System DFT: 6.0 mils.
   d. Ferrous Metals - Previously Coated and intumescent fireproofing:
      i. System Latex Finish:

         Sheen: Satin.

         Prime Coat: Acrylic Latex Ferrous Metal Primer

         Under Coat: Interior Latex Enamel at 1.5 mils.

Top Coat: Interior Latex Enamel at 1.5 mils.

System DFT: 3.0 mils (excluding existing and touch-up primer).

1.01 Gypsum Surfaces:

a. Gypsum Board:

i. System Flat Latex Finish at ceilings:

Sheen: Flat

Prime Coat: Latex Primer at 1.0 mils.

Under Coat: Interior Latex Flat Paint at 1.4 mils.

Top Coat: Interior Latex Flat Paint at 1.4 mils.

System DFT: 3.8 mils.

ii. System Latex Finish at Walls:

Sheen: Eggshell.

Prime Coat: Latex Primer at 1.0 mils.

Under Coat: Interior Latex Enamel at 1.4 mils.

Top Coat: Interior Latex Enamel at 1.4 mils.

System DFT: 3.8 mils.

iii. System Water Based Epoxy at Toilet Rooms:

Sheen: Satin.

Prime Coat: Latex Primer at 1.0 mils.

Under Coat: Water Based Epoxy at 2.5 mils.

Top Coat: Water Based Epoxy 2.5 mils.

System DFT: 6 mils.

4. Wood Surfaces:

a. Painted Wood Panels and Trim:

i. System Opaque Latex Paint Finish:

Sheen: Semi-Gloss.

Prime Coat: Alkyd Enamel Undercoater at 2.0 mils.

Under Coat: Interior Latex Enamel at 1.5 mils.

Top Coat: Interior Latex Enamel at 1.5 mils.

System DFT: 5.0 mils.

3.12 PAINT COLORS

A. Exterior Surfaces: Selected by Architect/Engineer/Owner - Verify.

B. Interior Surfaces: Selected by Architect/Engineer/Owner - Verify.

END OF SECTION 09 90 00

SECTION 09 90 02
HIGH PERFORMANCE PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes requirements for providing high performance painting and coating. Includes preparation, cleaning, protection, application and materials for areas that require high performance painting and coating systems, including, but not limited to,

B. Related Sections Include:

1. Division 1
2. Division 3 – Concrete.
3. Division 5 – Metals.
4. Section 09 06 00 – Schedule for Finishes.
5. Section 09 90 00 – Painting and Coating.
6. Division 40 – Process Integration.
7. Division 43 – Process Gas and Liquid Handling Equipment.
8. Division 46 – Water and Wastewater Process Equipment.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Water Works Association (AWWA):
2. ANSI/ASTM D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
3. Environmental Protection Agency (EPA).
4. Occupational Safety and Health Act (OSHA).
5. Current Joint Standards for the Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers International (NACE).
6. Ten States Standards – 54.5 Piping Code.

1.03 DEFINITIONS

A. Conform to ANSI/ATSM D16 for interpretation of terms used in this Section.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00. Indicate each material and cross-referenced specified coating, finish system, and application. Identify each material by manufacturer’s catalog number and general classification.

B. Provide Product data on all Products including manufacturer’s technical information, label analysis, and instructions for handling, mixing, storing, and applying each coating material. Submit manufacturer's application instructions under provisions of Section 01 33 00.

C. Provide a paint system data sheet for each coating system, including all components for providing a complete system. Components include surface preparation, primer,

intermediate coats, and finish coats.

D. Provide paint manufacturers certification that proposed coating systems meet specified performance requirements.

E. Submit five (5) full color sample sheets illustrating available colors for each scheduled surface finish Product. During the shop drawing review process, Engineer and Owner will select color choices for surfaces to be coated. Submit samples under provisions of Section 01 33 00.

F. If the manufacturer of finish coating differs from that of shop primer, provide finish coating manufacturer's written confirmation that materials are compatible for each instance.

G. Before proceeding with Work under this section, finish one complete space or item of each color scheme required showing selected colors, finish texture, materials, quality of work, and special details

1.05 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paints and finish products with minimum ten (10) years' experience.

B. Applicator: Minimum 10 years' experience in application of specified products.

C. Regulatory Requirements:

1. Meet federal, state, and local requirements limiting the emission of volatile organic compounds.

2. Perform surface preparation and painting in accordance with recommendations of the following:

a. Paint manufacturer's instructions.

b. SSPC PA 3, Guide to Safety in Paint Applications.

c. Federal, state, and local agencies having jurisdiction.

D. Maintain examples of SSPC visual standards on Site.

E. Provide wet and dry paint thickness measurement instrument on Site.

F. Specification language for High Performance Coating Systems is based on Sherwin Williams and Tnemec.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivered materials shall be stockpiled and stored at locations approved by the OWNER until required for installation. Materials shall be transported, delivered, stored and handled in accordance with manufacturer's instructions and the requirements of Section 01 61 00.

B. Protect shop painted surfaces during shipment and handling by suitable provisions including padding, blocking, and use of canvas or nylon slings.

C. Primed surfaces shall not be exposed to weather for more than 2 months before being topcoated, or less time if recommended by coating manufacturer.

D. Take precautionary measures to prevent fire hazards and spontaneous combustion. Removal all paint waste from site daily and dispose of properly.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable Montana Department of Public Health and Human Services, Montana Department of Environmental Quality, Environmental Protection Agency, Occupational Health and Safety Administration, Ten States Standards, Uniform Building Code, and Uniform Fire Codes and Standards.

B. All Products that may come into contact with water intended for use in a Public Water System shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A Product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each Product.

1.08 THREE YEAR PERFORMANCE GUARANTEE

A. The quality of both materials and workmanship for the installed coating materials (as defined in this specification) will be the sole responsibility of the Contractor. It is hereby guaranteed that should the coating material delaminate, chip, peel, blister, crack or otherwise fail due to improper surface preparation, improper mixing and application or curing of coating materials or protection of the coating work during cure by the Contractor or due to lack of material quality on the part of the material manufacturer, the Contractor shall repair or replace the damaged or failing coating to Owner's satisfaction at no cost to Owner and at Owner's convenience. Should the existing substrate below the coating fail causing such coating failure, except if related to inadequate surface preparation or coating quality causing substrate corrosion, the Contractor shall not be held liable.

B. It is further understood by the Contractor that any incompatibility with or error in formulation of the coating materials used on this project, which results in a coating failure, will be a financial matter strictly between the Coating System Manufacturer and the Contractor. The business responsibility and financial accountability for such a material related failure to Owner would remain solely with the Contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Mechanical Protective Coating Systems: All paint materials selected for coating systems for each type of system shall be the product of one manufacturer. Acceptable manufacturers are:

1. Tnemec
2. Sherwin-Williams (SW) Industrial Coating.

B. Coating systems of all manufacturers must be in accordance with the Contract Documents. Being named as a manufacturer does not eliminate their responsibility of providing coating systems in compliance with the following specification section. Any deviations without sufficient evidence proving equal or superior quality shall be rejected without further review or comment.

C. Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

D. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions and obtain approval from Engineer before bidding in accordance with Division 01.

2.02 ABRASIVE MATERIALS

A. Select abrasive type and size to produce surface profile that meets coating manufacturer's recommendations for specific primer and coating system to be applied.

2.03 PAINT MATERIALS

A. General:

1. Manufacturer's highest quality products suitable for intended service.

2. Compatibility: Only compatible materials from a single manufacturer shall be used in the Work. Particular attention shall be directed to compatibility of primers and finish coats.

2.04 MIXING

A. Multiple-Component Coatings:

1. Prepare using each component as packaged by paint manufacturer.

2. No partial batches will be permitted.

3. Do not use multiple-component coatings that have been mixed beyond their pot life.

4. Mix only components specified and furnished by paint manufacturer.

5. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

B. Colors: Formulate paints with colorants free of lead, lead compounds, or other materials that might be affected by presence of hydrogen sulfide or other gas likely to be present at Site.

2.05 SHOP FINISHES

A. Shop Blast Cleaning: Reference Paragraph, Shop Coating Requirements.

B. Surface Preparation: Provide Engineer minimum 7 days' advance notice to start of shop surface preparation work and coating application work.

C. Shop Coating Requirements:

1. When required by equipment Specifications, such equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.

2. Where manufacturer's standard coating is not suitable for intended service condition, Engineer may approve use of a tie-coat to be used between manufacturer's standard coating and specified field finish. In such cases, tie-coat shall be surface tolerant epoxy as recommended by manufacturer of specified field finish coat. Coordinate details of equipment manufacturer's standard coating with field coating manufacturer.

D. Pipe:

1. Ductile Iron Pipe:

a. Use SSPC standards as a guide for desired prepared surface.

b. Follow recommendations of pipe and coating manufacturers for means and methods to achieve SSPC-equivalent surface.

c. The surface preparation and application of the primer and finish coats shall be performed by pipe manufacturer.

d. For high performance (epoxy) coatings, follow additional recommendations of pipe and coating manufacturers.

e. Prior to blast cleaning, grind smooth surface imperfections, including, but not limited to delaminating metal or oxide layers.

f. For conventional (alkyd) coatings, clean asphalt varnish supplied on pipe and apply one full coat of a tar stop before two full coats of the color coats specified.

2.06 SPARE PARTS

A. Furnish small quantity kits (minimum one gallon per product per color) for touchup painting and for painting other small areas.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide Engineer minimum 7 days' advance notice to start of field surface preparation work and coating application work.

B. Perform the Work only in presence of Engineer, unless Engineer grants prior approval to perform the Work in Engineer's absence.

C. Environmental Requirements:

1. Do not apply paint in temperatures or moisture conditions outside of manufacturer's

recommended maximum or minimum allowable.

2. Do not perform final abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dew point of ambient air.

D. Schedule inspection of cleaned surfaces and all coats prior to succeeding coat in advance with Engineer.

3.02 EXAMINATION

A. Factory Finished Items:

1. Review other Section in which primers are provided to ensure compatibility of the total system for various substrates

2. Schedule inspection with Engineer before repairing damaged factory finished items delivered to Site.

3. Test shop applied primer and finishes for compatibility with subsequent coating and covering materials.

4. Repair abraded or otherwise damaged areas on factory-finished items as recommended by coating manufacturer. Carefully blend repaired areas into original finish. If required to match colors, provide full finish coat in field.

B. Surface Preparation Verification: Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

3.03 PROTECTION OF ITEMS NOT TO BE PAINTED

A. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere to be painted.

B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.

D. Mask openings in motors to prevent paint and other materials from entering.

E. Protect surfaces adjacent to or downwind of Work area from overspray.

3.04 SURFACE PREPARATION

A. Field Abrasive Blasting:

1. Perform blasting for items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed or coated.

2. Refer to coating systems for degree of abrasive blasting required.

3. Where the specified degree of surface preparation differs from manufacturer's recommendations, the more stringent shall apply.

B. Metal Surface Preparation:

1. Where indicated, meet requirements of SSPC Specifications summarized below:

   a. SP 1, Solvent Cleaning: Removal of visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants by cleaning with solvent.

   b. SP 2, Hand Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, using nonpower hand tools.

   c. SP 3, Power Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, sing power-assisted hand tools.

   d. SP 5, White Metal Blast Cleaning: Removal of visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter by blast cleaning.

   e. SP 6, Commercial Blast Cleaning: Removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products and other foreign matter of at least 66⅔% of a sample unit area at least 3"x3" (9 in^2). Light shadows, slight streaks, or minor discolorations caused by stains of rust, mill scale, or previously applied coating in less than 33⅓% of the unit area is acceptable.

   f. SP 10, Near-White Blast Cleaning: Removal of visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter, except for random staining limited to no more than 5 percent of each unit area of surface which may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, mill scale or previously applied coatings.

2. The words "solvent cleaning", "hand tool cleaning", "wire brushing", and "blast cleaning" or similar words of equal intent in these Specifications or in paint manufacturer's specification refer to the applicable SSPC specification.

3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturers' recommendations for wet blast additives and first coat application shall apply.

4. Ductile Iron Pipe Supplied with Asphaltic Varnish Finish: Remove asphaltic varnish finish prior to performing specified surface preparation.

5. Hand tool clean areas that cannot be cleaned by power tool cleaning.

6. Round or chamfer sharp edges and grind smooth burrs, jagged edges, and surface defects.

7. Welds and Adjacent Areas:

   a. Prepare such that there is:

      i. No undercutting or reverse ridges on weld bead.

ii. No weld spatter on or adjacent to weld or any area to be painted.

iii. No sharp peaks or ridges along weld bead.

b. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.

8. Preblast Cleaning Requirements:

a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.

b. Cleaning Methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.

c. Clean small isolated areas as above or solvent clean with suitable solvent and clean cloth.

9. Blast Cleaning Requirements:

a. Type of Equipment and Speed of Travel: Design to obtain specified degree of cleanliness. Minimum surface preparation is as specified herein and takes precedence over coating manufacturer's recommendations.

b. Select type and size of abrasive to produce surface profile that meets coating manufacturer's recommendations for particular primer to be used.

c. Use only dry blast cleaning methods.

d. Do not reuse abrasive, except for designed recyclable systems.

e. Meet applicable federal, state, and local air pollution and environmental control regulations for blast cleaning, confined space entry (if required), and disposition of spent aggregate and debris.

10. Post-Blast Cleaning and Other Cleaning Requirements:

a. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth.

b. Paint surfaces the same day they are blasted. Reblast surfaces that have started to rust before they are painted.

C. Galvanized Metal, Copper, and Nonferrous Metal Alloy Surface Preparation:

1. Remove soil, cement spatter, and other surface dirt with appropriate hand or power tools.

2. Remove oil and grease by wiping or scrubbing surface with suitable solvent, rag, and brush. Use clean solvent and clean rag for final wiping to avoid contaminating surface.

3. Obtain and follow coating manufacturer's recommendations for additional

preparation that may be required.

D. Concrete Surface Preparation:

1. Do not begin until 30 days after concrete has been placed.
2. Meet requirements of SSPC SP 13.
3. Voids and other defects that are at or near the surface shall be exposed during surface preparation.
4. Brush-off blast clean to remove loose concrete and laitance, and provide a tooth for binding. Upon approval by Engineer, surface may be cleaned by acid etching method. Approval is subject to producing desired profile as listed in section 3.07 below based on the required coating system. If not specifying, surface profile to the equivalent to No. 80 grit flint sandpaper. Acid etching of vertical or overhead surfaces shall not be allowed. Coordinate blast clean with buffing requirements provided in Division 03 – Concrete.
5. Remove grease, oil, dirt, salts or other chemicals, loose materials, or other foreign matter by solvent, detergent, or other suitable cleaning methods.
6. Secure coating manufacturer's recommendations for additional preparation, if required, for excessive bug holes exposed after blasting.
7. Unless otherwise required for proper adhesion, ensure surfaces are dry prior to painting.

E. Plastic and FRP Surface Preparation:

1. Hand sand plastic surfaces to be coated with medium grit sandpaper to provide tooth for coating system.
2. Large areas may be power sanded or brush-off blasted, provided sufficient controls are employed so surface is roughened without removing excess material.

F. Masonry Surface Preparation:

1. Complete and cure masonry construction for 14 days or more before starting surface preparation work.
2. Remove oil, grease, dirt, salts or other chemicals, loose materials, or other foreign matter by solvent, detergent washing, or other suitable cleaning methods.
3. Clean masonry surfaces of mortar and grout spillage and other surface deposits using one of the following:
    a. Nonmetallic fiber brushes and commercial muriatic acid followed by rinsing with clean water.
    b. Brush-off blasting.
    c. Water blasting.
4. Do not damage masonry mortar joints or adjacent surfaces.

5. Leave surfaces clean and, unless otherwise required for proper adhesion, dry prior to painting.
6. Masonry Surfaces to be Painted: Uniform texture and free of surface imperfections that would impair intended finished appearance.
7. Masonry Surfaces to be Clear Coated: Free of discolorations and uniform in texture after cleaning.

G. Gypsum Board Surface Preparation: Typically, new gypsum board surfaces need no special preparation before painting.
1. Surface Finish: Dry, free of dust, dirt, powdery residue, grease, oil, or any other contaminants.

3.05 SURFACE CLEANING

A. Brush-off Blast Cleaning:
1. Equipment, procedure, and degree of cleaning shall meet requirements of SSPC SP 7.
2. Abrasive: Either wet or dry blasting sand, grit, or nutshell.
3. Select various surface preparation parameters, such as size and hardness of abrasive, nozzle size, air pressure, and nozzle distance from surface such that surface is cleaned without pitting, chipping, or other damage.
4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
5. Engineer will review acceptable trial blast cleaned area and use area as a representative sample of surface preparation.
6. Repair or replace surface damaged by blast cleaning.

B. Acid Etching:
1. After precleaning, spread the following solution by brush or plastic sprinkling can: One part commercial muriatic acid reduced by two parts water by volume. Adding acid to water in these proportions gives an approximate 10 percent solution of HCl.
2. Application:
a. Rate: Approximately 2 gallons per 100 square feet.
b. Work acid solution into surface by hard-bristled brushes or brooms until complete wetting and coverage is obtained. c. Acid will react vigorously for a few minutes, during which time brushing shall be continued.
c. After bubbling subsides (10 minutes), hose down remaining slurry with high pressure clean water.
d. Rinse immediately to avoid formation on the surface of salts that are difficult to remove.

e. Thoroughly rinse to remove any residual acid surface condition that may impair adhesion.

3. Ensure surface is completely dry before application of coating.

4. Apply acid etching to obtain a “grit sandpaper” surface profile. If not, repeat treatment.

C. Solvent Cleaning:

1. Consists of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by using solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods that involve a solvent or cleaning action.

2. Meet requirements of SSPC SP 1.

3.06 APPLICATION

A. General:

1. In general, all new and modified existing structures and items, whether specifically mentioned or not, shall be painted, unless otherwise noted. Do not paint exterior concrete surfaces, unless specifically indicated.

a. Interior concrete walls, floors, and ceilings within the WRRF.

b. Interior concrete block masonry within the WRRF and modified concrete block masonry.

c. All new doors and frames and window frames (if required) within the expanded WRRF.

d. Exterior, interior, and submerged ferrous metals.

e. Miscellaneous other metals.

f. Paint shop-primed equipment and fixtures.

g. Unfinished louvers, grilles, covers, and access panels on mechanical and electrical components; paint separately.

h. Prime and paint all surfaces located behind, underneath, or otherwise previously obstructed by items that have been removed or demolished.

i. Prime and paint all surfaces of new process pipes (non-insulated and insulated), electrical conduit, valves, fittings, meters, boxes, hangers, brackets, collars, and supports, except where items are prefinished.

j. Paint discharge heads and base plates of all new or modified pumps.

k. Prime and paint all new unburied exterior steel, ductile, galvanized, or PVC piping.

l. Replace identification markings on mechanical or electrical equipment when painted accidentally.

m. Paint exposed conduit and electrical equipment occurring in finished areas.

n. Paint both sides and edges of plywood backboards for electrical equipment before installing equipment.

o. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

p. All surfaces not specifically excluded

2. Extent of Coating (Immersion): Coatings shall be applied to internal vessel and pipe surfaces, nozzle bores, flange gasket sealing surfaces, carbon steel internals, and stainless steel internals, unless otherwise specified.

3. For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating until completion of curing cycle.

4. Apply coatings in accordance with these Specifications and paint manufacturers' printed recommendations and special details. The more stringent requirements shall apply. Allow sufficient time between coats to assure thorough drying of previously applied paint.

5. Apply a stripe coat of an approved coating system via brush or roller to all weld seams, edges, angles, and mechanical connections. Stripe coat shall be applied after primer coat and be of a different color than the primer coat.

6. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

7. Coat units or surfaces to be bolted together or joined closely to structures or to one another prior to assembly or installation.

8. On pipelines, terminate coatings along pipe runs to 1 inch inside pipe penetrations.

9. Keep paint materials sealed when not in use.

10. Where more than one coat is applied within a given system, alternate colors to provide a visual reference showing required number of coats have been applied.

B. Galvanized Metal, Copper, and Nonferrous Metal Alloys:

1. Concealed galvanized, copper, and nonferrous metal alloy surfaces (behind building panels or walls) do not require painting, unless specifically indicated herein.

2. Prepare surface and apply primer in accordance with Protective Coating System specification.

3. Apply intermediate and finish coats of the coating system appropriate for the exposure.

C. Porous Surfaces, Such As Concrete and Masonry:

1. Filler/Surfacer: Use coating manufacturer's recommended product to fill air holes, bug holes, and other surface voids or defects.

2. Prime Coat: May be thinned to provide maximum penetration and adhesion.
    a. Type and Amount of Thinning: Determined by paint manufacturer and dependent on surface density and type of coating.
3. Surface Specified to Receive Water Base Coating: Damp, but free of running water, just prior to application of coating.

D. Film Thickness and Coverage:
1. Number of Coats:
    a. Minimum required without regard to coating thickness.
    b. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.
2. Application Thickness:
    a. Follow coating manufacturer's recommendations.
    b. Measure using a wet film thickness gauge to ensure proper coating thickness during application.
3. Film Thickness Measurements and Electrical Inspection of Coated Surfaces:
    a. Perform with properly calibrated instruments.
    b. Recoat and repair as necessary for compliance with Specification.
    c. Coats are subject to inspection by Engineer and coating manufacturer's representative.
4. Visually inspect concrete, masonry, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.
5. Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.
6. Apply additional coats as required to achieve complete hiding of underlying coats. Hiding shall be so complete that additional coats would not increase the hiding.

3.07 HIGH PERFORMANCE COATINGS SYSTEMS AND APPLICATION SCHEDULE

A. Refer to Section 09 06 00, Schedules for Finishes for specific surfaces to be coated in accordance with the following Systems 1 thru 14. Additional requirements are included in the Piping Schedule.

B. In the event of discrepancies or omissions in the following, defer to Section 09 06 00 and request clarification from Engineer before starting work in question.

C. System No. 1: Ferrous Metals, Exterior Exposure, Non immersion

System Type	Surface Preparation	Primer Coat 3.0 to 5.0 DFT	Intermediate Coat	Topcoat, 2.0 to 3.0 DFT
Polyamidoamine	SSPC SP6	Tnemec Series N69, SW Macropoxy 646	NA	Tnemec Series 1075, High Solids Polyurethane @ 2-3 mils DFT

1. Use two coat coating system for maintenance coating of structural steel. For non-immersed, non-corrosive environments.
2. Use on new exposed metal surfaces, located outside of structures, including structural steel, metal decking, guard posts, hollow metal doors and frames, piping, equipment, and miscellaneous metal.

D. System No. 2: Ferrous Metals, Interior Exposure, Non-Immersion

System Type	Surface Preparation	Primer Coat, 3.0 to 5.0 DFT	Intermediate Coat	Topcoat, 3.0 to 5.0 DFT
Polyamidoamine	SSPC SP10	Tnemec Series N69, SW Duraplate 235 MPE	NA	Tnemec Series N69, SW Duraplate 235 MPE

1. For interior two coat coating system for coating of carbon steel and other ferrous metals. For non-immersed, mildly corrosive splash/spill and wet environments.
2. For exposed metal surfaces located inside of structures, exposed to weather or in a highly humid atmosphere, such as pipe galleries, and for the specific surfaces:
    a. Exterior surfaces of process pipes. All pipes scheduled to be insulated must be painted prior to providing insulation.
    b. Exterior surface of valves.
    c. Exterior surface of equipment not shop finished, per manufacturer’s instructions.
    d. Pipe supports, excluding stainless and galvanized steel.

E. System No. 3: Ferrous Metals, Immersion

System Type	Surface Preparation	Primer Coat, 3.0 to 5.0 DFT	Intermediate Coat	Topcoat, 3.0 to 5.0 DFT
Polyamidoamine	SSPC SP10	Tnemec Series N69, SW Duraplate 235 MPE	NA	Tnemec Series N69, SW Duraplate 235 MPE

1. Verify with manufacturer a compatible field tie-in coat for shop primed items where applicable.
2. Use on immersed metal surfaces, metal surfaces above maximum liquid surface that

are a part of immersed equipment, concrete embedded surfaces of metallic items, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, structural steel, and interior surfaces of steel piping noted in the Piping Schedule.

a. Submerged, partially submerged and splash area equipment not shop finished.

F. System No. 4: Ferrous Metals, Immersion and/or H2S Exposure

System Type	Surface Preparation	Primer Coat	Intermediate Coat	Topcoat
Moisture Cured Polyurethane	SSPC SP10	Tnemec Series 1 Omnithane (2.5 to 3.5 mils DFT), Or SW Equivalent	Tnemec Series 446 (8.0 to 10.0 mils DFT), Or SW Equivalent	Tnemec Series 446 (8.0 to 10.0 mils DFT), Or SW Equivalent
Reinforced Amine Epoxy	SSPC SP 10	SW Corothane 1-GalvaPac(3.0 to 4.0 mils DFT), Or Tnemec Equivalent	SW Sher-Glass FF (8.0 to 20.0 mils DFT), Or Tnemec Equivalent	SW Sher- Glass FF (8.0 to 20.0 mils DFT), Or Tnemec Equivalent

1. Use on immersed metal surface, metal surfaces above maximum liquid surface that are a part of immersed equipment, concrete embedded surfaces of metallic items, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel, and interior surfaces of steel piping noted in the Piping Schedule in areas with potential H2S exposure. These areas include:

G. System No. 5: Metals, Buried and/or Below Grade

System Type	Surface Preparation	Primer Coat, 3.0 to 5.0 mils DFT	Intermediate Coat	Topcoat, 16.0 to 20.0 mil DFT
Coal tar epoxy	SSPC SP10	Tnemec Series N69 (optional), SW Macropoxy 646 (optional)	NA	Tnemec Series 46H- 413, SW Hi-Mil Sher-Tar Epoxy

1. For steel pipe and fittings, follow AWWA C209 and AWWA C214 with double outer wrap.

2. For buried, below grade portions of metal items, except buried stainless steel, and the follow specific surfaces:

   a. Fasteners and accessories for buried piping

   b. Buried Valves

H. System No. 6: Metals, Concrete Embedded and Encased

System Type	Surface Preparation	Primer Coat	Intermediate Coat, 8.0 to 10.0 mils DFT	Topcoat, 8.0 to 10.0 mils DFT
Coal tar epoxy	SSPC SP6	NA	Tnemec Series 46H-413, SW Hi-Mil Sher-Tar Epoxy	Tnemec Series 46H-413, SW Hi-Mil Sher-Tar Epoxy

1. For concrete embedded and encased surfaces of metallic items, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles.

I. System No. 7: Galvanized Metal, Copper, and Nonferrous Metal Alloy Conditioning:

System Type	Surface Preparation	Primer Coat, 3.0 to 5.0 mils DFT	Intermediate Coat	Topcoat, 3.0 to 5.0 mils DFT
Epoxy Polyamide	Abrasive brush blast to create a 1.5 mil profile	Tnemec Series N69, SW Macropoxy 646	NA	Tnemec Series N69, SW Macropoxy 646

1. Verify with manufacturer compatibility as a field tie-in coat.
2. Use on the following items or areas:
   a. Galvanized surfaces requiring painting.
   b. After application of System No. 7, apply System No. 1 topcoat for exterior, System No. 3 topcoat for interior.

J. System No. 8: PVC, CPVC and FRP, Exposed

System Type	Surface Preparation	Primer Coat, 2.0 to 4.0 mils DFT	Intermediate Coat	Topcoat, 2.0 to 4.0 mils DFT
Polyamidoamine	Scarify	Tnemec Series N69, SW Macropoxy 646	NA	Tnemec Series N69, SW Macropoxy 646

1. For use on exposed PVC, CPVC, and FRP.

K. System No. 9: Insulated Pipe, Exposed:

System Type	Surface Preparation	Primer Coat, 2.0 to 3.0 mils DFT	Intermediate Coat	Topcoat, 2.0 to 3.0 mils DFT
Acrylic	Clean and Dry	Tnemec Series 6, SW DTM primer/finish	NA	Tnemec Series 6, SW DTM primer/finish

1. For use on insulation of insulated pipes.
2. Coat pipes with appropriate coating system before insulating.

L. System No. 10: Concrete, Precast and Poured in Place, Immersion, Light H2S Vapor:

System Type	Surface Preparation	Primer Coat (Filler) 1 Coat Up To ½" Thick As Needed	Intermediate Coat 3.0 to 5.0 mils DFT	Topcoat, 3.0 to 5.0 mils DFT
Polyamidoamine	SSPC SP13, ICRI CSP2-3	Duraplate 2300, Tnemec Series 218 MortarClad (60 to 65 mils DFT)	Tnemec Series N69, SW Duraplate 235 MPE	Tnemec Series N69, SW Duraplate 235 MPE

1. Prep surface in accordance with concrete surface preparation.
2. For use on walls and ceilings in areas with light to moderate H2S exposure.

M. System No. 11: Concrete, Precast and Poured in Place, Immersion, High H2S

System Type	Surface Preparation	Primer Coat	Intermediate Coat	Topcoat
Fiber reinforced MP Epoxy	SSPC SP13, ICRI CSP4-6	Tnemec Series 218 MortarClad (60 to 65 mils DFT), Duraplate 2300 (1 Coat Up to ½" Thick As Needed)	NA	Tnemec Series 436 (50 to 80 mils DFT), Duraplate 6000 (50-80 mils DFT)

1. Prep surface in accordance with concrete surface preparation.
2. For use on walls and ceilings in areas with moderate to heavy H2S exposure.
3. Schedule for:
   a. Wetwell;
   b. Buried Concrete Tanks & Manhole Structure Interiors.

N. System No. 12: Concrete, Precast and Poured in Place, Immersion

System Type	Surface Preparation	Primer Coat (Filler) 1 Coat Up To ½" Thick As Needed	Intermediate Coat 3.0 to 5.0 mils DFT	Topcoat, 3.0 to 5.0 mils DFT
Polyamidoamine	SSPC SP13 ICRI CSP2-4	Tnemec Series 218 MortarClad (60-65 mils DFT), SW Duraplate 2300 MPE	Tnemec Series N69, SW Duraplate 235 MPE	Tnemec Series N69, SW Duraplate 235 MPE

1. Prep surface in accordance with concrete surface preparation.
2. For use on floors, walls and ceilings in areas with no to minimal H2S exposure.

O. System No. 13, Concrete Secondary Containment, Chemical Resistant Paint

System Type	Surface Preparation	Primer Coat, Per Mnfr recommendation	Intermediate Coat Per Mnfr recommendation	Topcoat Per Mnfr recommendation
Epoxy	SSPC SP13 ICRI CSP5	Tnemec Series 218, Duraplate 2300 ½" Thick As Needed	Tnemec Series 104, SW Sherglass FF	Tnemec Series 104 SW Sherglass FF

1. Prep surface in accordance with concrete surface preparation.
2. For use on floors and walls in secondary containment basins.
3. Scheduled for:
   a. Concrete pedestals.

P. System No. 14 Aluminum and Dissimilar Metal Insulation:

System Type	Surface Preparation	Primer Coat	Intermediate Coat	Topcoat
Bituminous	Abrasive blast to provide a 3.0 mil angular anchor profile	NA	NA	Tnemec Series 46H- 413, SW Hi-Mil Sher-Tar Epoxy

1. Use on aluminum surfaces embedded or in contact with concrete and for dissimilar metal insulation.

3.08 COLORS

A. Provide as designated herein and shown in Piping Schedule or as selected by Engineer.

B. Proprietary identification of colors is for identification only. Selected manufacturer may supply matches.

C. Equipment Colors:

1. Equipment includes the machinery or vessel itself plus the structural supports and fasteners and attached electrical conduits.

2. Paint non-submerged portions of equipment the same color as the piping it serves, except as itemized below:

   a. Dangerous Parts of Equipment and Machinery: OSHA Orange.

   b. Fire Protection Equipment and Apparatus: OSHA Red.

   c. Radiation Hazards: OSHA Purple.

   d. Physical hazards in normal operating area and energy lockout devices, including, but not limited to, electrical disconnects for equipment and equipment isolation valves in air and liquid lines under pressure: OSHA Yellow.

D. Pipe Identification Painting:

1. Color code non-submerged metal piping, except electrical conduit. Paint fittings and valves the same color as pipe, except equipment isolation valves.

2. Pipe Color Coding: In accordance with the "Recommended Standards For Wastewater Facilities" and as specified in Section 40 27 60 – Process Identification.

3. On exposed stainless steel piping, apply color 24 inches in length along pipe axis at connections to equipment, valves, or branch fittings, at wall boundaries, and at intervals along piping not greater than 9 feet on center.

4. Pipe Supports: Painted light gray, as approved by Engineer.

3.09 FIELD QUALITY CONTROL

E. Sharp edges, weld spatter, scab marks, and other imperfections shall be ground to a smooth radius or removed and re-blasted before coating application.

F. Testing:

1. Thickness and Continuity Testing:

   a. Measure coating thickness specified in mils with a magnetic type, dry film thickness gauge, in accordance with SSPC PA 2. Check each coat for correct millage. Do not make measurement before a minimum of 8 hours after application of coating.

   b. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final tests may also be conducted by Engineer.

G. Inspection: Leave staging and lighting in place until Engineer has inspected surface or coating. Replace staging removed prior to approval by Engineer.

1. Provide additional staging and lighting as requested by Engineer.

H. Unsatisfactory Application:

1. If item has an improper finish color or insufficient film thickness, clean surface and

topcoat with specified paint material to obtain specified color and coverage. Obtain specific surface preparation information from coating manufacturer.

2. Evidence of runs, bridges, holidays, laps, or other imperfections is cause for rejection.

3. Repair defects in accordance with written recommendations of coating manufacturer.

I. Damaged Coatings, Pinholes, and Holidays:

1. Feather edges and repair in accordance with recommendations of paint manufacturer.

2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather the edges. Follow with primer and finish coat. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.

3. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

3.10 MANUFACTURER'S SERVICES

J. In accordance with Section 01 40 00, Manufacturers' Field Services, coating manufacturer's representative shall be present at Site as follows:

1. On first day of application of any coating system.

2. A minimum of two additional Site inspection visits, each for a minimum of 4 hours, in order to provide Manufacturer's Certificate of Proper Installation.

3. As required to resolve field problems attributable to or associated with manufacturer's product.

4. To verify full cure of coating prior to coated surfaces being placed into immersion service.

3.11 CLEANUP

K. Upon completion of the Work, remove staging, scaffolding, and containers from Site or destroy in a legal manner.

L. Remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.

END OF SECTION 09 90 02

DIVISION 10

MISC SPECIALITIES

SECTION 10 11 01
VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. Fixed Dry Erase Magnetic Glass Markerboards

1.02 SUBMITTALS

A. General: Submit in accordance with Section 01 30 00.

B. Product Data:

1. Submit manufacturer's descriptive literature and product specifications for each product.

2. Include information for factory finishes, accessories, and other required components.

C. Submit following Submittals:

1. Shop Drawings: Provide shop drawings for each type of VSD required.

2. Product Data: Provide technical data for materials specified including MSDS.

3. Samples: Provide Samples to illustrate finish and texture.

4. Manufacturer’s Instructions: Provide Manufacturer’s installation and cleaning instructions.

D. Closeout Submittals:

1. Warranty: Submit a warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer’s instructions and recommendations, Claridge glass markerboard writing surfaces are guaranteed for ten (10) years. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

1.03 QUALITY ASSURANCE

A. Operation and Maintenance Data: Submit manufacturer's printed, recommended regular cleaning instructions, stain removal instructions, and surface break-in instructions for markerboards.

B. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 5 years documented experience.

1.04 HANDLING

A. Comply with requirements of Section 01 60 00.

1.05 SEQUENCING

A. Ensure finishes, including painting, are completed and accepted prior to installation of work of this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Manufacturers:

1. Basis of Design: Claridge Products and Equipment, Inc., www.claridgeproducts.com.

2. Or equal product with prior approval by Architect per Section 01 60 00 Product Requirements.

2.02 MATERIALS

A. Glass Markerboards
   1. Glass: ¼ -inch thick, tempered, low-iron, extra clear, safety writing glass with polished edges
   2. Glass Markerboard writing surface: Smooth finish intended for use with dry-erase markers
   3. Sizes:
      a. 3'x3' Lift Station (location determined by Owner)
      b. Size and location determined by package plant manufacturer, approved by engineer
   4. Back-Coated Color: Brilliant White.
   5. Backing: Provide steel backing permanently adhered to the back of the glass for magnetic function.

B. Mounting Methods
   1. Invisimount (Z-bar hanger clips) – no visible mounting hardware; concealed hanger mounted to back of board. Full-length, minus 3", concealed z-bar hanger for the wall. Furnished with 3M Dual Lock™ fasteners to hold bottom of board firmly in place. Z-bar mounting method to pass 500 lb. load test without failure. Designate MGMI (magnetic) or PGBI (non-magnetic)

C. Accessories
   1. Provide Optional Marker Caddy and Magnetic Eraser (Magnetic Glass Markerboards only)
   2. Provide two dry erase markers each in black, red, and green (6 total markers).

PART 3 – EXECUTION

3.01 PROJECT CONDITIONS

A. Interior moisture and temperature should approximate normal occupied conditions.

B. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.

3.02 INSTALLATION

A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.

B. Follow manufacturer's instructions for storage and handling of units before installation.

C. Do not install on damp walls or in damp and humid weather without heat in the building.

D. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

3.03 ADJUST AND CLEAN

A. Verify that all accessories are installed as required for each unit.

B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END SECTION 10 11 01

SECTION 10 14 00
SIGNS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the work necessary to furnish and install all informational and warning signs and their mounting requirements in the Lift Station, Package Plant and On-Site. Signs include custom-fabricated informational and warning signs, and luminous "Exit" signs.

B. Pipe identification lettering and color-coding are not covered by this section; instead see Section 40 27 60 – Process Identification and Division 09 - Coatings.

1.02 SUBMITTALS

A. In addition to the requirements of Section 01 33 00 – Submittal Procedures and 01 40 00 – Quality Requirements, the following documentation shall also be provided for signs, and accompany other required submittals:

1. Scaled drawings and specifications covering materials, mounting fixtures, and locations shall be submitted for each sign in accordance with project submittal requirements.

2. Product samples consisting of a 3" x 3" coupon of sign sheeting complete with proposed lettering shall be provided for each sign style and material to be used.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the site clearly labeled with the manufacturer's name, product identification, and lot number where appropriate.

B. Materials shall be protected from damage during transit, handling, storage and installation.

C. Fabricated sign panels shall be delivered with protective poly sheeting adhered to the lettered surface to protect from scratching. Any scratched or otherwise damaged signs shall be replaced by the Contractor at no additional cost to the Owner.

PART 2 - MATERIALS

2.01 INTERIOR/EXTERIOR INFORMATIONAL & WARNING SIGNS

A. Signs shall be provided with stainless steel fasteners or adhesives suitable for the substrate at the mounting location. Adhesives shall be removable without permanent damage to the substrate.

B. The sign manufacturer shall verify all sign graphics before fabrications. Signs with typographical or format errors shall not be installed, and replaced.

C. Sign Panels

1. Sign panels shall be composite panels with aluminum face and back, and

thermoplastic core. Aluminum faces shall be coated with factory-baked polyester paint. Panels shall be Alucobond Architectural Dibond®, Omega Panel Products Laminators Omega-Bond™, or equal.

2. Panel background color shall be as indicated in the Sign Schedule herein.
3. Sign panels shall be cut to the dimensions shown in the Sign Schedule herein. All panel corners shall be cut to a smooth ¼" radius. Mounting holes shall be neatly drilled and symmetrical with panel geometry. Panel edges, corners, and mounting holes shall be de-burred and smooth.

D. Sign Panel Lettering

1. Sign lettering shall be "Arial Black" font, all capital letters, in the sizes indicated in the Sign Schedule herein.
2. Sign lettering shall be permanently adhered, vinyl lettering, suitable for the sign panel material. Lettering and lettering adhesive for outdoor signs shall be UV protected and suitable for outdoor use without peeling or cracking.

E. Interior/Exterior Sign Schedule

Sign Text	No. Reqd	Location(s)	Panel Size (H x W)	Letter Height	Color	
					Letters	Background
CAUTION – SEWAGE TREATMENT FACILITY	TBD	On all package plant access doors	12" x 18"	1.5"	Yellow	Black
LIFT STATION	1	On access door to the Lift Station	6" x 12"	1.50"	black	white
UV DISINFECTION	1	At UV Disinfection point in the package plant	6" x 18"	1.50"	black	white
UV CONTROL PANEL	1	On wall near UV control panel	3" x 6"	0.50"	black	white
NON-POTABLE WATER – DO NOT DRINK	TBD	At each NPW demand point in the package plant	3" x 9"	0.50"	black	white
POTABLE WATER	TBD	At each potable water hose bib point in the package plant and the Lift Station	2" x 9"	0.50"	black	white
INFLUENT PUMPS	2	On pump pedestal for Pumps	2" x 9"	0.50"	black	white

Sign Text	No. Reqd	Location(s)	Panel Size (H x W)	Letter Height	Color	
					Letters	Background
EFFLUENT PUMPS	2	On wall by pump access points	2" x 9"	0.50"	black	white
INFLUENT/EFFLUENT PUMP CONTROL PANEL	1	On control panel	3" x 10"	0.50"	black	white
CAUTION - TURN ON EXHAUST FAN BEFORE OPENING HATCH – CONFINED SPACE ENTRY	1	On wall above floor access hatch to raw wet-well	10" x 18"	1.00"	white	red
CAUTION - RAW WETWELL – CONFINED SPACE ENTRY	1	On wall above floor access hatch to raw wet-well	6" x 18"	1.00"	white	red
PLANT EFFLUENT FLOW	2	Wall at flowmeter display in package plant and lift station	3" x 8"	0.50"	black	white
PRIMARY SETTLING TANK	3	On tank access hatches and vent	3" x 8"	0.50"	black	white
EQUALIZATION TANK	4	On tank access hatches and vent	3" x 8"	0.50"	black	white
SLUDGE HOLDING TANK	3	On tank access hatches and vent	3" x 8"	0.50"	black	white

F. Package Plant Signs – if package plant has signs that differ from the schedule above and have different material specifications they shall be approved by the engineer. Package plant may have additional signage required depending on the equipment located inside of the facility. All equipment shall have an identification sign and any warning/caution signage needed for occupancy safety.

G. Educational Signage – The package plant shall contain signage with a description of the treatment process to allow the plant to be used for educational purposes for the Flathead Lake Biological Station. These signs shall be a part of the package plant equipment. Signage and the information on the signs shall be approved by the Engineer.

2.02 EXTERIOR SIGN BLADES

A. All guide signs must meet the requirements of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

B. Flat Aluminum Blades shall be:

1. manufactured using a domestic aluminum alloy, Type 6061-T6 or better quality;
2. a minimum thickness of 0.080";
3. treated with an Alodine 1200E or similar anodizing process in order to enhance longevity.

C. Reflective Sheeting shall be:

1. High Intensity Prismatic (HIP) sheeting. Any "Or Equal" vendor materials must be approved by OWNER prior to any manufacturing or installations. Currently approved materials are:
   - 3M #3930, HIP Silver/White
   - 3M #3931, HIP Yellow
   - 3M #3932 HIP Red
   - 3M #4083 HIP Yellow Green
2. Type I Engineering Grade reflective sheeting unless otherwise noted;
3. Type III high-intensity prismatic reflective sheeting on all warning signs: pedestrian/trail crossings; No Motor Vehicles; Stop; etc.
4. Foreground colors, lettering, symbols and designs shall be:
   i. Type I Engineering Grade reflective sheeting cut-out unless otherwise noted;
   ii. Affixed to the sign surface with high-durability, pressure-sensitive adhesive.
5. All ElectroCut (E/C) Film shall use the following approved materials. Any "Or Equal" vendor materials must be approved by OWNER prior to use.
   - 3M #1177C E/C Green
   - 3M #1179C E/C Brown
   - 3M #1172C E/C Red
   - 3M #1178C E/C Black
   - 3M #1175C E/C Blue
6. All warning and informational blades shall be made using the appropriate colors for pedestrian crossing signs; share the road signs, directional arrows (3M #3931 HIP Yellow background) and 3M #1178C Black for lettering and symbols.

2.04 LUMINOUS EXIT SIGNS

A. Exit signs shall be photoluminescent, glow-in-the-dark signs requiring no wiring or batteries. Signs shall be wall-mounted, single-sided, 8" tall by 15" wide. Exit signs shall be UL 944 and C-UL U.S. listed. Signs shall be non-radioactive. Signs construction shall be anodized 0.035" steel and plastic, with pop-out arrows for customized direction indication. Signs shall be furnished with mounting brackets. Body color shall be red.

B. Exit signs shall be Lab Safety Supply #159179R, manufactured by Glo Brite, or equal.

PART 3 - EXECUTION

3.01 MOUNTING

A. Mount all custom-fabricated, lettered signs at 5'-0" A.F.F., unless otherwise noted in Sign Schedule or on the Drawings. Where dual signs are required at same location, place lower sign 4'-0" A.F.F. and place upper sign directly above, separated by 3". If specified sign locations conflict with other wall-mounted items, adjust locations to nearest clear wall space.

B. Mount all signs using either galvanized steel or stainless steel fasteners. Any signs located within 3'-0" of chemical storage tanks or chemical feed pumps must be mounted with stainless steel fasteners and hardware.

C. Mount Exit signs in accordance with manufacturer’s recommendations, and NFPA standards.

D. Mount signs level, and centered on walls or next to identified objects shown in the Sign Schedule and the Drawings.

END OF SECTION 10 14 00

DIVISION 22

PLUMBING

SECTION 22 00 00
PLUMBING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the work necessary to furnish and install piping, fixtures, appliances, equipment, and appurtenances for complete and functional plumbing systems as indicated in the Drawings and specified herein.

B. Work included in this section is as follows:

1. Hot and cold water piping systems
2. Natural gas piping systems
3. Propane gas piping system
4. Drainage and vent piping systems and connections
5. Floor drains, cleanouts and bell-ups

1.02 GENERAL

A. Piping and appurtenances provided under these Specifications do not require coating per Section 09 90 00 – PAINTING & COATING, except as specified herein.

B. The Drawings do not show all details of all piping systems, and instead only portray the functionality required. The Contractor shall provide all accessories, adapters, appurtenances and supports to achieve a complete and functional installation. The Contractor shall verify all piping routings and locating dimensions shown for conflicts with other piping or utilities, and shall provide any offsets required to achieve clearance at no additional cost to the Owner. In the event changes to the locations of equipment or piping shown are necessary, the Contractor shall submit such changes in writing to the Engineer before proceeding with such changes.

C. All fixtures and appliances shall be installed in complete accordance with the manufacturer's recommendations and requirements, including structural support and venting.

D. Manufacturers' references are included herein for reference and to establish the required level of quality; "or equal" products may be proposed subject to the requirements for Submittal review.

1.03 CODES, PERMITS AND COMPLIANCE

A. Plumbing work shall be performed in accordance with all applicable codes and ordinances which pertain to such work. In case of conflict between these specifications and any applicable code or ordinance, the latter shall govern. Plumbing work shall conform to the provisions of the current version of the Uniform Plumbing Code.

B. All gas piping shall be installed in accordance with the recommendations of the National Fire Protection Association (NFPA).

C. Any permits legally required for the work under these Specifications shall be the responsibility of the Contractor to obtain. Costs of such permits and scheduling of any inspections required in conjunction with such permits or associated requirements shall be the responsibility of the Contractor.

D. Completed piping systems shall be tested by the Contractor in accordance with all applicable codes and standards before charging such piping. Natural gas & propane gas piping test results must comply with all requirements of the gas supplier.

1.04 SUBMITTALS

A. In addition to the requirements of Section 01 33 00 – SUBMITTAL PROCEDURE, the following documentation shall also be provided for this equipment and accompany other required submittals:

1. Fixtures and Appliances – Provide unit weight and manufacturers' support requirements, storage and installation instructions, and operating manual.

2. Pipe Supports – Provide manufacturers' dimensions, load ratings, recommended service conditions and spacing, and types and arrangement of fasteners, including substrate requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Like items of material provided under these Specifications shall be the product of one manufacturer.

2.02 COPPER PIPE, TUBING AND FITTINGS

A. Exposed pipe for building air shall be hard drawn, Type L copper, conforming to ASTM B88, except where otherwise shown and called on the Drawings.

B. Fittings for copper pipe and tubing shall be solder-joint socket pure wrought copper, conforming to ASTM B75 and dimensions conforming to ANSI B16.22. Solder shall be 95-5 wire, lead free, ASTM B32, Alloy Grade 95 TA. Paste flux shall be used with solder, and shall meet Fed. Spec. O-F-506, Type I, Form A.

C. Insulating unions, where required, shall be brass body, dielectric type, with threaded ends, adapted to copper pipe and tubing with solder-by-NPT brass adapters.

2.03 MALLABLE IRON PIPE AND FITTINGS

A. Exposed pipe for natural gas service shall be Schedule 40 black welded steel, meeting the requirements of ASTM A53 Grade B and ANSI/ASME B1.20.1, except piping 1½-inch and smaller shall meet ASTM A106 Grade B. Pipe shall be seamless or electric resistance welded. Gas piping shall be UPC-rated for gas service.

B. Pipe joints may be NPT threaded or welded, conforming to ASTM A-120. All threaded joints shall be sealed with gas-rated thread compound.

C. Fittings shall be Schedule 40 black malleable iron, 150 psi rated, with NPT threading.

Fittings shall conform to ASTM A197 and ANSI/ASME B16.3 and B1.20.1. Fittings shall be UL-listed.

2.04 GALVANIZED STEEL PIPE AND FITTINGS

A. Galvanized steel piping for miscellaneous applications as shown and called on the Drawings shall be carbon steel, Schedule 40, meeting ASTM A120, ASTM A53 Grade B, or ASTM A106 Grade B.

B. Galvanized steel pipe fittings and joints shall be threaded. Fittings shall be Schedule 40, galvanized, meeting ASTM A196 or ASTM A47. Fitting dimensions shall conform to ANSI B16.3. Unions shall be 300-pound malleable iron, galvanized, with brass to iron seats.

2.05 PVC PIPE AND FITTINGS

A. Building interior piping for *drain, waste, and vent* applications shall be UL-listed. PVC – Drain/Waste/Vent (DWV) Pipe and Fittings

1. DWV pipe and fittings are intended for non-pressure drainage applications where the temperature will not exceed 140°F.
2. DWV pipe shall be IPS Schedule 40 conforming to ASTM D 1785 and ASTM D 2665.
3. DWV pipe and fittings shall be manufactured from PVC compound with minimum cell class of 12454 per ASTM D 1784 and conform with NSF Standard 14.
4. Injection molded fittings shall conform to ASTM D 2665.
5. Fabricated fittings shall conform to ASTM F 1886.

B. Approved Manufacturers:

1. Georg Fischer
2. Charlotte
3. Hayward.
4. Approved equals.

C. Pipe joints shall be socket-type glued joints, except where threaded adapters or unions are shown or needed to connect to fixtures. PVC gluing materials shall conform to pipe and fitting manufacturers' recommendations, and if so recommended, may utilize solvent cement rated for use without primer. Glue shall be tinted to verify application.

D. Pipe fittings shall be Schedule 80 PVC, and recommended by the pipe manufacturer for compatibility with the pipe.

E. For interior cold-water supply applications, use Schedule 40 or Schedule 80 PVC, as indicated in the Drawings. For hot-water applications, use CPVC piping.

2.06 CPVC PIPE AND FITTINGS

A. All potable and non-potable water pipe, fittings, and valves shall be manufactured from a

CPVC compound which meets the requirements of class 23447-B, Type 4, Grade 1 in accordance with ASTM D1784. Compound from which the pipe is produced shall have a design stress rating of 2,000 psi at 23 degrees C, listed by the Plastic Pipe Institute (PPI).

B. Fittings and valves shall meet the requirements of ASTM F439 (schedule 80 socket) or ASTM F437 (schedule 80 threaded).

C. All socket type connections shall be joined with CPVC solvent cement conforming to the requirements of ASTM F493.

D. All CPVC shall be Schedule 80.

E. Approved Manufacturers:

1. Georg Fischer.
2. Hayward.
3. Asahi/America.
4. Spear.

2.07 PLUMBING PIPE SUPPORTS AND ACCESSORIES

A. Wall-mounted pipe supports for lines 1½-inch and smaller shall be one-hole, clamp type, and shall be *Grinnell Figure 126*, or equal.

B. Wall-mounted pipe supports for lines larger than 1½-inch shall be welded steel, heavy duty clamp type, and shall be *Grinnell Figure 199*, or equal.

C. Hanger pipe supports shall be cradle type with hanger rods and clevises, and shall be *Grinnell Figure 104* or *Figure 260*.

D. Fasteners for pipe clamps and hangers shall be as recommended by the support manufacturer, and shall be suitable for proper anchorage to the substrate material to which attached. Fasteners shall be galvanized steel.

E. Sealants shall be used on all threaded pipe joints and shall be rated for the fluid carried by the conduit. Sealants may be approved pipe thread compound(s). *Teflon* tape thread sealant may not be used.

F. Pipe and tubing wall penetrations through precast walls shall be sleeved with Schedule 40 PVC pipe spools with a nominal diameter at least 2 inches larger than the carrier pipe, and a length equal to the wall thickness. After insertion of the carrier pipe, the annular space inside the sleeve shall be sealed at each wall surface with *Dow Chemical Great Stuff* expandable foam, or equal. Pipe and tubing penetrations through wood-framed, gypsum board walls do not require sleeves, but shall be sealed with sheetrock mud.

2.08 CORPORATION STOPS AND CURB VALVES

A. Corporation stops and curb valves for new water service shall meet all standards of the public water supply system, including end connection configurations and use of tapping saddles. Stops and valves shall be all brass construction and 175 psig pressure rated. Stops and valves shall include double O-ring seals, and meet ANSI/AWWA C800

standards. Corporation stops and curb valves shall be *Mueller 300 series*, or equal.

B. Boxes for buried curb valves shall be cast iron, improved extension type with arch pattern base. Boxes shall have brass pentagon plugs, and shall be *Mueller H-10336*, or equal.

2.09 WATER SERVICE METERS

A. Water service meters shall meet the requirements of the public water supply system, along with AWWA C700 standards, and ANSI/NSF Standard 60 certification.

B. Meters shall be of the nominal size shown on the Drawings.

C. Meter read-out and transmitter configuration shall conform to meter reading requirements of the public water supply system.

2.10 WATERLESS DRAIN TRAP SEAL

A. Floor drains shall have a waterless drain trap seal. The seal shall have an HDPE housing with a heavy duty silicone diaphragm and a soft EPDM rubber sealing gasket.

B. Waterless drain trap seal shall install into the outlet of drain bodies, or drain hubs to protect the trap seal from evaporation. The seal shall create a physical barrier that blocks sewer gases and their odors from escaping.

C. Waterless drain trap seal shall have a floor rating meeting or exceeding ASSE 1072 AF GW.

D. Waterless drain trap seal shall be SURE SEAL manufactured by Rectorseal, or approved equal.

2.11 BALL VALVES – WATER SERVICE

A. Interior valves for 2-inch and smaller hot and cold water service shall be all bronze, end entry type, with *Teflon* seats and packing and lever operators with fixed stops. Valves shall be rated 400-pound WOG, and shall have threaded ends. Valves shall be *Nibco T-585-70, Grinnell Figure 3500*, or equal.

2.12 BALL VALVES – GAS SERVICE

A. Interior valves for gas service shall be of cast brass body and plug design, with brass stem and chrome-plated brass ball. Operators shall be tee-style lever handles. Valves shall conform to ANSI Z21.15B, and shall be *Nibco Series GB*, or equal.

B. All valves shall be in accordance with all applicable codes and standards.

2.13 HOSE VALVES / WALL HYDRANTS

A. Interior hose valves shall be 3/4-inch nominal size with bronze body and internals, and aluminum handwheels. Service connection shall be NPT threaded. Hose valve shall include a vacuum breaker for protection against back-siphonage. Hose valve shall be *Watts Model SC8*, or equal.

B. Exterior hose valves (wall hydrants) shall be 3/4-inch nominal size, and of frost-proof automatic self-draining design. Operating mechanism shall be set back 12 inches from outlet. Integral backflow prevention (vacuum breaker) shall be included. Wall hydrant

construction shall be brass body with nickel plated finish, brass vacuum breaker mechanism, metal handle, and 0.8mm copper tube thickness. Wall hydrant shall be *Watts Series FHB*, or equal.

2.14 PUMP MECHANICAL SEAL FLUSH WATER TUBING

A. Tubing for process pump mechanical seal flush systems shall meet the following:

1. Rigid tubing: As shown on the Construction drawings, 316 stainless steel rated for 350 psi with flared connections, or copper tubing in accordance with the plumbing specifications.

2. Flexible tubing: braided stainless steel jacketed 200 psi neoprene

B. Pressure gages for seal flush lines shall be as specified in Section 03/400 Process Instruments. Isolation and control valves for seal flush lines are specified in Section 40 63 00 – Process Control Systems Equipment.

PART 3 - EXECUTION

3.01 GENERAL

A. All plumbing and installation of piping, appurtenances, and fixtures shall fully conform to the current edition of the *Uniform Plumbing Code* (UPC), and all applicable state and local regulations. All work shall be approved by the State Plumbing Inspector.

B. Drawings do not attempt to show the exact details of all piping. No extra payment will be allowed for fittings, adapters, appurtenances, clearances or offsets required to complete the Work. Where diagrams have been made to show piping connections, the Contractor is cautioned that these diagrams must not be used for obtaining material quantities. Changes in locations of equipment or piping, advisable in the opinion of the Contractor, must be submitted to the Engineer in writing, and cannot be executed without the Engineer's approval. All measurements and dimensions shall be verified at the site. All equipment shall be adjusted and left in a conditions satisfactory to the Engineer. All work shall be completed to provide a fully functional installation as shown and specified.

C. Unions shall be provided in piping systems where shown, and adjacent fixtures and appliances where necessary to assure proper alignment without stressing piping members of fixture connections. Insulating (dielectric) unions shall be provided on domestic hot and cold water piping at all connections between steel and copper (or brass) piping and for all connections to electrically powered appliances.

D. Plumbing fixtures shall be plumbed, trapped, and vented as required by UPC, and as shown. In the event of conflicts between the plumbing requirements shown and UPC, requirements of the Code shall take precedence.

E. And preparation of the structural components of the building required for equipment and material regarding this unit of the Contract shall be done by the particular affected trade and shall be done to the satisfaction of the Engineer, and work which is deemed unsatisfactory shall be removed and reinstalled until the approval of the Engineer is obtained. The work carried on under this Contract shall be done in a neat an orderly

fashion.

3.02 PIPING

A. Piping runs shall be level and plumb, except where slopes are specifically called or shown.

B. Pipes shall be adequately supported by clamps or hangers at intervals not to exceed 10 feet, and either side of all changes in direction. Where additional supports may be needed to provide pipe stability, they shall be provided at no additional cost.

C. Solvent-weld PVC pipe jointing shall be allowed to fully cure in an unstressed and unloaded position.

D. All piping intended to carry potable water shall be disinfected before placing into service. Disinfection procedures shall conform to AWWA C651.

E. Pipe sizes shown on the Drawings are nominal sizes, unless noted otherwise. Provide all piping which passes through walls, floors or ceilings with pipe sleeves as shown in the drawings.

F. Install unions in piping system wherever they will expedite removal of equipment and valves. Install manual air vents at high points in domestic hot water system.

G. Equipment: Drawings do not attempt to show all integral piping, vents, and accessories for equipment to be installed. The Contractor shall install equipment in accordance with manufacturer's piping diagrams and instructions.

3.03 CORPORATION STOPS AND CURB VALVES

A. Corporation stop and curb valve installation shall meet the appropriate requirements of *Montana Public Works Standard Specifications* and requirements of the public water supply system. Taping of existing mains shall be authorized by or performed by water system personnel. Curb boxes shall be plumbed and adjusted to grade.

3.04 FIXTURES AND APPLIANCES

A. Factory finishes on all fixtures and appliances shall be adequately protected during shipping, storage, and installation to prevent damage. Finish damage shall be grounds for requiring replacement of affected fixtures and appliances at the Contractor's sole cost.

B. All plumbing fixtures and appliances shall be installed, leveled, adjusted, and tested in full accordance with manufacturers' recommendations, and UPC and IBC requirements. Each plumbing fixture shall be trapped and vented as required by code. General vent locations are shown, but all details required for venting are not included in the drawings. The Contractor shall be responsible for final vent pipe routing. Fixtures and drains shall be installed true and plumb with separate stops for each fixture supply. Galvanized nipples shall not be used between copper water connections. Install chrome-plated canopy flanges at each fixture drain where P-trap arm enters wall.

C. Following installation of the completed plumbing systems, the proper function of all fixtures and appliances shall be demonstrated in the presence of the Engineer.

3.05 DRAINS AND CLEANOUTS

A. Drain lines and fixtures shall be kept free of foreign materials at all times, and adequately protected during construction from the entry of such materials, as well as from cosmetic, structural, or functional damage.

B. All drains shall be equipped with P-traps, including floor drains. Floor drains shall have a deep-seal P-trap installed as close to the drain as possible.

C. Floor drains and floor cleanouts shall be set with their upper rims flush with the finished floor slab. During pouring and finishing concrete floor slabs, drain and cleanout fixtures shall be adequately secured to avoid movement or floating as concrete is placed. Concrete floors shall be finished to uniformly slope to floor drains, as indicated on the Drawings.

D. PVC piping and gas appliance flue roof vents (VTR's) shall be surface mounted to CMU walls, using suitable pipe clamps to secure installation. Vent and flue lines shall be plumb, and sealed through ceiling and roof surfaces. Roof penetrations shall be sealed with elastomeric roof jacks.

3.06 DRAINAGE AND VENT PIPING

A. Drainage and vent piping shall be installed where required and shall, in general, conform to the locations indicated on the Drawings. Horizontal soil and waste pipes 3 inches and small shall have a grade of 1/4-inch per foot. Horizontal soil and waste piping 4 inches and larger may have a grade of 1/8-inch per foot.

B. Drainage piping which is required to be buried beneath floors or underground shall be cast iron soil pipe or ductile iron pipe, as indicated on the Drawings and as specified in other sections, to a point not less than 5 feet beyond the outside face of the structure.

C. Cast iron soil pipe shall be service weight, hubless type. Rubber couplings shall be used.

D. Acid resistant drain piping shall be used where shown on the Drawings.

E. Bell-ups shall be installed with the top rim 2-inches above the floor surface.

F. All vents passing through roofs shall be located at least 10 inches from the intersection of a cant with the roof deck, and shall be adequately flashed as indicated on the Drawings and as specified.

3.07 PUMP MECHANICAL SEAL WATER FLUSH LINES

A. Seal flush systems for process pump mechanical seals shall be as recommended by the pump and seal manufacturers, and installed as shown on the Drawings. Seal flush water flow shall be solenoid controlled, to activate anytime pumps run, either in "auto" or "hand" control mode.

B. Seal flush lines shall be thoroughly flushed after installation and then flow tested by the Contractor using a time-to-fill container method to demonstrate delivery of the required water flow. Flush line control solenoid interlocks to pump starting circuits shall be demonstrated and verified as operable before proceeding with process pump testing or

startup.

C. Seal water flush lines flow and pressure regulators and appurtenances shall be wall-mounted, or ceiling-mounted, as shown on the Drawings. Seal water tubing connections to pump units shall use flexible, braided stainless steel jacketed tubing for the length shown connecting to pumps.

3.08 TESTING

A. Completed hot and cold water piping, including fixture connections shall be tested and demonstrated to be leak free by the Contractor by charging with water and maintaining 60 psi pressure, using the house water system, in the presence of the Engineer. Any leaks or defects shown shall be promptly remedied by the Contractor.

B. Completed drain piping shall be tested and demonstrated to be leak free by the Contractor in the presence of the Engineer by filling with clean water to the elevation of the highest point in the system, and sustaining that water level for a period of 3 hours without loss.

C. Other tests of completed piping as prescribed by the UPC shall also fully apply, and shall be conducted in the presence of the Engineer.

D. Completed natural gas and propane gas piping must be fully completed and tested by the Contractor in the presence of the Engineer before gas service is connected by the gas utility. The Contractor shall assure that all gas piping and appurtenances are suitable for connection and startup, and fully conform to the all code and utility's requirements.

END OF SECTION 22 00 00

SECTION 22 14 29
SUMP PUMP & CONTROL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section. Requirements for the electrical work associated with the installation of the SCADA system and associated electrical equipment are included in Division 26.

1.02 SUMMARY

A. It is the intention that this specification shall cover a complete Electrical sump pump System (including discharge piping, valve and dual check valves), as hereinafter described and all necessary appurtenances which might normally be considered a part of the complete electrical system for this installation. The system shall consist of a ½ hp submersible sump pump (Zoeller Model 98 submersible pump), onboard control system; disconnect; transformer and switch gear. The system will monitor water level in the existing concrete sump through the pump's onboard float switch. Signals shall be transmitted between the float switch and the pump controller to initiate pump start and pump off. The control system shall also be capable of announcing an alarm signal to the plant SCADA and a visual alarm in the lift station - in case of malfunction of the sump pump. The alarm system shall be triggered by a set of dry contacts used as a high level alarm in the sump pit. The control system shall be factory assembled, wired and tested and covered by complete electrical drawings and instructions.

B. The Zoeller Model 98 submersible pump includes a 120V, single phase motor with 9.4 amps running and 29.2 amps starting. All wiring, breakers, switches, etc., shall be sized to safely provide the necessary power without any overcurrent concerns.

1.03 QUALITY ASSURANCE

A. Provide components that comply with NFPA 70 and that are listed and labeled by UL where applicable. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.00

PART 2 - SUBMITTAL INFORMATION

2.01 SUBMITTAL

A. General: Submit items in this Article according to the Conditions of the Contract and Division Specifications Sections.

B. Product Data for the sump pump shall include physical dimensions and data on features, components, ratings, and performance. Include wiring diagram and elevation views of the front panel/keypad where applicable. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these

specifications.

C. Product Data for the discharge piping, fittings, manual valve and check valves.

2.02 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall provide 2 complete sets of hard-covered ring bound loose-leaf and 1 electronic copy of the O&M manuals. In addition to “as-built” system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section.

B. The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing and maintenance of each component and/or instrument.

PART 3 - WARRANTY

3.01 GENERAL WARRANTY

A. The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

3.02 WARRANT PERIOD

A. Two (2) Years from the date of Substantial Completion.

PART 4 - FIELD SUPERVISION

4.01 TESTING AND STARTUP

A. Field Tests -All system components shall be checked to verify that they have been installed properly and that all terminations have been made correctly. Witnessed field tests shall be performed on the complete system. Each function shall be demonstrated to the satisfaction of the Owner and Engineer.

END OF SECTION 22 14 29

DIVISION 23

HVAC

SECTION 23 01 00
HVAC

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers heating and ventilating systems for the Lift Station Building including electric unit heaters, supply and exhaust fans, motorized dampers/louvers, and ductwork.

B. Electrical systems to support HVAC equipment are detailed in the Section 26 – Electrical.

1.02 SUBMITTALS

A. The following submittals for construction shall be made in accordance with the project submittal requirements as described in the Supplementary Conditions.

1. Manufacturer's catalog cuts and specification sheets.
2. Performance data for airflow and electrical draw.
3. Detailed dimensional drawings.
4. Installation instructions, including wiring diagrams.
5. Heating efficiencies and energy consumption.
6. Operation and maintenance manuals.

1.03 COORDINATION OF WORK

A. Heating and ventilation work shall be carefully coordinated with all other work to assure proper support, clearance, electrical service, and final performance.

1.04 GENERAL REQUIREMENTS

A. Standard Products. Equipment furnished under this section shall be the standard product of the manufacturer. Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of each system need not be the product of one manufacturer unless specified herein.

B. Accuracy of Data. The Drawings show the work contemplated, but the Contractor shall be solely responsible for making his own measurements and installing his work to fit the conditions encountered. Before beginning any work, the Contractor shall examine all Drawings and report to the Engineer any apparent discrepancies or interferences.

C. Metal Gauge. The gauge of sheet metal specified herein refers to U.S. Standard gauge and is the minimum permissible thickness.

D. Balancing of Fans and Blowers. All fans and blowers shall be statically and dynamically balanced by the manufacturer before shipment. Whenever possible, the balancing shall be done with the fan wheels mounted on the shaft on which they will operate. Fan shafts shall not pass through their first critical speed as the unit comes up to the rated rpm. Any

fan or blower determined to be out of balance by the Engineer shall be field-balanced by a certified balancing contractor. Equipment vibration shall not exceed 3 mils peak-to-peak at bearings of equipment in the vertical, horizontal or axial directions.

E. Equipment Guards. All rotating equipment shall be provided with adequate guards which conform to OSHA requirements.

F. Lubrication and Tools. Equipment requiring lubrication prior to startup shall be lubricated. Any special tools required for the operation or adjustment of equipment shall be furnished.

G. UL Listing. All electrically operated ventilation equipment shall be UL listed.

1.05 QUALITY ASSURANCE

A. Governing Standards and Codes. All work covered by this section shall be performed in accordance with all applicable codes, laws, and regulations. In case of conflict between these Specifications and any code, law, or regulations, the latter shall govern. All work shall comply with UL safety requirements.

B. Materials and Equipment. All major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the product of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable.

C. Prevention of Rust. Unless otherwise specified, all ferrous sheet metal surfaces other than ductwork shall be shop-painted using a rust-inhibiting treatment consisting of galvanizing or bonderizing, followed by a rust-inhibiting primer and finish paint. Field painting, if required, shall be in accordance with the painting section. Surface finish damaged during installation shall be repaired in accordance with the painting section.

D. Operation and Maintenance Instructions. Copies of all instruction books, parts lists, and wiring diagrams covering all equipment items furnished shall be provided in accordance with the submittals section. The copies shall be bound and delivered.

PART 2 - PRODUCTS

2.01 GENERAL

A. Refer to the HVAC Schedules in the Construction Drawings for specific manufacturer model numbers and capacities for all HVAC equipment required for the project. “Or equal” alternatives to manufacturers and models listed will be considered, subject to equivalency in performance, functionality and quality, and based on the requirements for Submittal review.

B. Dampers and wall-mounted fans shall be suitable for insertion in existing building walls or ductwork. Unit frames shall span full masonry depth, or flashing matching frame material shall be installed to span the difference between the frame and wall depths.

C. Louver and damper performance data shall be licensed under the AMCA Certified

Ratings Program and shall bear the AMCA Certified Ratings Seal. This certified performance data shall include airflow, pressure loss, and water penetration. Power ventilators shall be AMCA licensed for air and sound performance data.

2.02 INDUSTRIAL SUSPENDED ELECTRIC UNIT HEATER

A. General

1. Color – Standard – Almond
2. Finish – Standard – epoxy/polyester powder paint

B. Construction

1. 18 and 20-gauge steel
2. Adjustable louvres to direct air flow
3. Vertical cone diffuser
4. High-limit temperature control with automatic reset

C. Voltage

1. 208V, 1-phase (confirm with electrical design for compatibility)
2. Some units may be field converted from 3 to 1-phase

D. Fan

1. Minimum 510 cfm airflow;
2. Motor mounted in cold compartment
3. Thermally-protected motor
4. Totally enclosed and factory-lubricated ball bearing motor
5. 58dBA fan
6. Fan delay purges heater of residual heat

E. Heating Element

1. Durable tubular heating elements; stainless steel
2. Concentric disposition of heating elements
3. Factory sealed element upon request
4. Minimum 25°F temperature rise

F. Control

1. All models have a factory-installed contactor
2. 240/208V control circuit standard (with transformer if necessary)
3. 24V relay, with or without transformer available
4. Wall mounted single-pole, low voltage thermostat

5. 120V control circuit

G. Manufacturer/Model

1. The electric unit heaters shall be:

a. Reznor/EGHB-4 (4KW)

b. Pre-approved equals

H. Installation

1. Horizontal wall or ceiling mounting using one of two supplied brackets which allow 360° rotation.
2. Vertical mounting using 4 threaded rods 1/2 in. X 13 UNC.
3. Vertical Diffuser cones provided
4. Large and easily accessible control compartment.
5. Maximum recommended height (horizontal): 2 to 10kW: 8 ft.; 15 to 30kW: 10 ft.; 40 to 60kW: 15 ft.
6. Protective screen allows lower mounting height.
7. 85 °F maximum operating ambient temperature.

I. Warranty

1. 1-year warranty against defects

2.03 VERTICAL MOUNT BACKDRAFT DAMPER

A. Construction

1. 0.125” extruded aluminum frame;
2. 6063T extruded aluminum damper blades (0.07” thick) with vinyl seals on closing edge
3. Synthetic (acetal) sleeve type axle/bearing;
4. Linkage Material: 304 S.S.

B. Manufacturer/Model

1. Greenheck Vertical Mount Exhaust Damper Models EM-30

2.04 CENTRIFUGAL DIRECT DRIVE UPBLAST WALL EXHAUST FAN

A. General

1. Color – Standard – Gray-RAL 7023
2. Finish – Standard – Hi-Pro Polyester

B. Construction

1. 16-gauge galvanized steel wall bracket;

2. Spark B Construction, UL 705 listed;
3. Backward inclined aluminum wheel;
4. Aluminum curb cap;
5. Drain trough;
6. Ball bearing motor mounted on shock mounts with corrosion-resistant fasteners;
7. Aluminum bird screen nominal 86% free area;
8. Aluminum rub ring;
9. Solid state speed control – 6 Amp, mounted and wired;

C. Greenheck Model CUE-099-C or approved equals.

1. CUE-099-B Shall be explosion proof and have a minimum performance of 70 CFM

2.05 CENTRIFUGAL FANS

A. General

1. Color – Standard – Gray-RAL 7023
2. Finish – Standard – Hi-Pro Polyester

B. Construction

1. Housing: Perma-Lock construction, unit support angles with pre-punched mounting holes. Adjustable motor plate.
2. Bearings, Shaft, and Wheel: Air handling quality, self-aligning, ball bearing in pillow block housing – polished, solid steel shafts – centrifugal wheel
3. Direct mount isolators, isolator-rubber mount, ¼”
4. Drain connection 1” drain hole, unthreaded
5. Inlet guard, galvanized
6. Exhaust/Backdraft Damper
    a. 18 gauge galvanized steel
    b. Damper Blades – 0.032 inches roll-formed aluminum with vinyl seals on the closing edge
    c. Steel Axles – 0.188 inch diameter zinc plated steel
    d. Bushings – Nylon
    e. Greenheck Model: WD-340 or approved equal

C. Greenheck Model USF-06 CW-TH and USF-08 CW-UB or approved equals

1. USF-06 CW-TH shall have a minimum performance of 140 CFM
2. USF-08 CW-UB shall have a minimum performance of 416 CFM

2.06 DUCTWORK

A. Ductwork shall be sized and routed as shown on the Drawings, providing adapters and transitions as necessary to fit nominal dimensions and penetrations as shown. Where called on the Drawings, double-wall insulated duct shall be used. Duct routings shall be laid out to clear all existing obstacles, including those not shown on the Drawings. The Contractor shall provide transitions and adjustments to nominal duct dimensions shown shall be made as necessary to avoid spatial conflicts.

B. Ductwork shall be supported on adjacent wall and ceiling surfaces with steel straps and suitable fasteners. Steel straps shall be 12-gage, galvanized or stainless steel to match duct material being supported. Ductwork installation shall include adequate supports to provide a stable, secure finished installation.

C. Manufactured Galvanized Round Duct:

1. Single-wall Round Duct: Unless otherwise shown on the Drawings, round duct shall be spiral lockseam, single-wall duct constructed with an interlocking helical seam running the length of the duct. Duct shall be manufactured from 18-gauge, galvanized (both sides) sheet steel.

2. Fittings for round duct shall be of the same manufacturer as, and fully compatible the duct. Fittings shall be of the same type of construction as the duct to which they're attached – single-wall or double-wall insulated

3. Single-wall round duct and fittings shall be McGill AirFlow Corporation UNI-SEAL duct, or equal.

4. Grilles for round duct shall be framed galvanized steel units of the sizes and orientations shown on the Drawings, and shall be from the same manufacturer as duct. Grilles shall include closed cell foam gasketing around their full perimeter. Grilles shall be McGill AirFlow Corporation model DDF-G Series, or equal.

D. Round PVC Duct:

1. PVC duct and fittings shall meet requirements of ASTMD-1784. Fittings and duct shall be gray in color.

2. All duct piping, sizes 6" through 24", shall be PVC seamless extruded type, This duct pipe shall be extruded from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784, trade name H707 PVC. All extruded PVC duct shall have a maximum flame spread rating of 25 or less per ULC S102.2. Material shall carry a maximum temperature rating of 140°F. All extruded PVC duct pipe shall be marked with the manufacturer's name or identifying symbol.

3. Joints to be solvent welded or hot air welded per manufacturer recommendation. Provide flanges as shown in the Drawings.

4. PVC duct and fittings shall be Harvel, Harrison Plastics, Spears, or equal.

E. Rectangular duct shall be fabricated of shall be 16-gauge, galvanized (both sides) sheet

steel. Duct joints shall be flanged or crimped. Crimped insertion type joints shall be riveted with self-expanding aluminum rivets spaced at a maximum of 6" O.C. The interior of finished ductwork sheet metal shall be trimmed of protrusions and obstructions.

F. Elastomeric bellows or flexible duct sections, compatible with adjacent rigid ducting, shall be provided at outlet connections of rotating HVAC equipment to attenuate resonance and vibration.

G. Outdoor Duct Insulation

1. Outdoor Duct Insulation shall consist of two outer layers of aluminum foil that reflect 97% of radiant heat. The outside layer of foil is made of heavier foil. Each layer of foil is bonded to a tough layer of polyethylene for strength. Two inner layers of insulating bubbles resist conductive heat flow while a center layer of polyethylene. Insulation shall be Reflectix or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Installation of heating and ventilating equipment shall be performed by qualified and experienced workmen in strict conformance with the Drawings and approved manufacturer's installation submittals.

3.02 EQUIPMENT MOUNTING

A. Wall openings to install HVAC equipment in buildings shall be made as part of the Work. Openings shall be true and clean, taking care to maintain the integrity of interior and exterior surfaces, insulation, and framing members. Provide temporary closures during installation to prevent moisture, rodents, and insects from entering wall cavities.

B. Contractor shall provide mounting members, wall openings, and closures as necessary to adapt equipment to building walls and structures. Supplemental wood or metal structural support members shall be added as required for a secure and finished installation. No exposed insulation or openings to the core of building walls will be permitted in the finished installation; provide adequate closures as part of the Work.

C. Equipment mounting shall utilize the manufacturer's flanging or self-framing accessories where available.

D. Installations shall be completed to isolate vibration and prevent excessive noise.

E. Contractor is responsible for any connection materials to allow the existing duct wok to connect to the new exhaust fans.

3.03 WIRING AND CONTROLS

A. Wiring and controls for ventilation equipment shall be provided and installed as shown on the Drawings, and specified in Section 26, ELECTRICAL.

B. Ventilation equipment shall be wired on dedicated circuits, not in combination with lighting or other electrical equipment, unless specifically shown otherwise on the

Drawings.

3.04 SYSTEM DEMONSTRATION

A. Once installation is complete, equipment and controls shall be demonstrated by the Contractor in the presence of the Engineer and the Owner. Any modifications or adjustments needed to equipment operation shall be made by the Contractor, following the demonstration, and the system(s) demonstrated once again.

END OF SECTION 23 01 00

DIVISION 26

ELECTRICAL

SECTION 26 00 00
ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 ELECTRICAL REQUIREMENTS

A. The electrical requirements are supplemental to the General and Supplementary Conditions and the General Requirements of these Specifications. The Electrical Sections shall apply to phases of the work specified, shown on the Drawings, or required to provide for the complete installation of Electrical Systems for this project.

B. The work shall include all items, articles, materials, operations and methods listed, mentioned or scheduled in these specifications and the accompanying drawings. All material, equipment and labor shall be furnished together with all incidental items required by good practice to provide the complete systems described.

C. Examine and refer to all Architectural, Structural, Utility, Landscape and Mechanical drawings and specifications for construction conditions which may affect the electrical work. Inspect the building site and existing facilities for verification of present conditions. Make proper provisions for these conditions in performance of the work and cost thereof.

D. See general requirements for listed Alternate Bids. Note alternates listed and include any changes in work and price required to meet the requirements of the respective alternate.

1.02 CODES AND STANDARDS

A. Work shall meet the requirements of the plans and specifications and shall not be less than the minimum requirements of applicable sections of the latest Codes and Standards of the following organizations:

American National Standards Institute (ANSI)
Americans with Disabilities Act (ADA)
Certified Ballast Manufacturers (CBM)
Electrical Testing Laboratories (ETL)
Independent Testing Laboratories (ITL)
National Electrical Code (NEC) Latest Edition
National Electrical Manufacturers Association (NEMA)
National Fire Protection Association (NFPA)
Occupational Safety & Health Act (OSHA)
Underwriters Laboratories (UL)
Uniform Building Code (UBC)
Rules and Regulations of the State Fire Marshal
Requirements of the Serving Utility Company
Local and State Codes and Ordinances

1.03 FEES AND PERMITS

A. The electrical contractor shall pay all fees and arrange for all permits required for work done under his contract and under his supervision by subcontract.

1.04 MATERIALS AND EQUIPMENT

A. Manufacturer's trade names and catalog numbers listed are intended to indicate the quality of equipment or materials desired. Manufacturers not listed must have prior approval. Written prior approval must be obtained from the Architect/Engineer ten (10) days prior to bid opening. Requests are to be submitted sufficiently ahead of the deadline to give ample time for examination. The items approved will be listed in an addendum and only this list of equipment will be accepted in lieu of specified products. Submittals must indicate the specific item or items to be furnished in lieu of those specified, together with complete technical and comparative data on specified items and proposed items.

B. Electrical equipment may be installed with manufacturer’s standard finish and color except where specific color, finish or choice is indicated. If the manufacturer has no standard finish, equipment shall have a prime coat and two finish coats of architect approved enamel.

C. This contractor shall be responsible for materials and equipment installed under this contract. Contractor shall also be responsible for the protection of materials and equipment of others from damage as a result of his work.

D. Manufactured material and equipment applied, installed, connected, erected, used, cleaned and conditioned as directed by manufacturer unless herein specified to the contrary.

E. This contractor shall make the required arrangement with General Contractor for the introduction into the building of equipment too large to pass through finished openings.

F. Store materials and equipment indoors at the job site or, if these are not possible, store on raised platforms and protect from the weather by means of waterproof covers. Coverings shall permit circulation of air around the materials to prevent condensation of moisture. Screen or cap openings in equipment to prevent the entry of vermin

G. Lighting fixtures proposed, as substitutes to those specified must have prior approval by Architect/Engineer as noted above. Approval will not be considered unless the request has all of the following information:

1. Manufacturers data showing catalog number.
2. Construction details.
3. Photometrics.

1.05 INTENT OF DRAWINGS

A. The drawings are partly diagrammatic and do not necessarily show exact location of conduit unless specifically dimensioned. Riser and other diagrams are schematic and do

not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining quantities or lineal runs of conduit.

B. The Contractor shall visit the site prior to the bid and examine all existing conditions. Discrepancies shown on different plans or between plans and actual field conditions shall be brought to the attention of the Architect/Engineer for resolution prior to the bid.

C. The plans and specifications go hand in hand. What is required in one is to be considered as required by both contract documents. If a conflict exists between the plans and the specifications the most stringent requirement of the two shall be interpreted as the intent of the documents.

1.06 RESPONSIBILITY

A. Be responsible for the installation of a satisfactory and complete system in accordance with the intent of the drawing and specifications. Provide, at no extra cost, all incidental items required for completion of the work even though they are not specifically mentioned or indicated on the drawings or in the specifications.

B. The drawings do not attempt to show complete details of the building construction which affect the electrical installation; and reference is therefore required to the Architectural, Structural, Landscape and Mechanical drawings and specifications and to shop drawings of all trades for additional details which affect the installation of the work covered under this Division of the Contract.

C. Location of electrical system components shall be checked for conflicts with openings, structural members and components of other systems having fixed locations. Components shall be mounted in such a manner to allow safe and adequate access to all switches, knobs, handles, and any other components necessary to operate such equipment. In the event of any conflicts, the Architect/Engineer shall be consulted and his decision shall govern. Necessary changes shall be made at no additional expense to the Architect/Engineer or Owner.

D. Determine, and be responsible for, the proper location and character of inserts for hangers, chases, sleeves and other openings in the construction required for the work, and obtain this information well in advance of the construction progress so work will not be delayed. Roughing-in fixtures, etc. must be laid out accurately. Connections to equipment of the same class shall be equal heights, plumb, and at right angles to the wall, unless otherwise directed.

E. Final location of inserts, hangers, etc., required for each installation, must be coordinated with facilities required for other installations to prevent interference.

F. Take extreme caution not to install work that connects to equipment until such time as complete Shop Drawings of such equipment have been approved by the Architect/Engineer. Any work installed by the Contractor, prior to approval of Shop Drawings, will be at the Contractor's risk.

G. At all times during the performance of this Contract, properly protect work from damage and protect the Owner's property from injury of loss. Make good any damage injury or

loss, except such as may be directly due to errors in the Bidding Documents or caused by Agents or Employees of the Owner. Adequately protect adjacent property as provided by law and the Bidding Documents. Provide and maintain passageways, guard fences, lights and other facilities for protection required by Public Authority or Local conditions.

H. Circuiting and switching shall be exactly as shown on drawings. Combining of home runs is acceptable but no more than three different phase, one neutral, one equipment ground and associated light switch conductors shall be installed in any single raceway except where specifically noted otherwise on the plans. Three phase branch circuits shall each be individually home run a separate raceway. Contractor shall refer to NEC Article 310.8 and adjust accordingly. Combining of wiring of various systems in conduit runs is not acceptable unless otherwise specified herein or noted on drawings.

1.07 INSPECTION

A. All work and material is subject to inspection at any time by the Architect/Engineer or his representative. If the Architect/Engineer or his representative finds material that does not conform with these specifications or that is not properly installed or finished, correct the deficiencies in a manner satisfactory to the Architect/Engineer at no additional expense to the Owner.

1.08 WORKMANSHIP

A. GENERAL

1. Work under this contract shall be performed by workmen skilled in the particular trade including work necessary to properly complete the installation in a workmanlike manner to present a neat and finished appearance.

B. CUTTING, PATCHING AND FRAMING

1. Obtain Architect's/Engineer's approval before performing any cutting on structural members or patching of building surfaces. Any damage to the building or equipment by this Contractor shall be the responsibility of this Contractor and shall be repaired by skilled craftsmen of the trades involved at no additional expense to the Owner.

2. Chases, openings, sleeves, hangers, anchors, recesses, equipment pads, framing for equipment, provided by others only if so noted on the drawings. Otherwise, they will be provided by this contractor for his work. Whether chases, etc., are provided by this contractor or others, this contractor is responsible for correct size and locations.

1.09 COORDINATION

A. This contractor shall plan his work to proceed with a minimum interference with other trades and it shall be his responsibility to inform the General Contractor of all openings required in the building structure for installation of work, and to provide sleeves as required. Dimensions of equipment installed and/or provided by others shall be checked in order that correct clearances and connections may be made.

1.10 CLEAN UP

A. Keep the premises free from accumulation of waste material or rubbish caused by his work or employees.

B. Upon completion of work, remove materials, scraps and debris relative to his work and leave the premises, including tunnels, crawl spaces, and pipe chases in clean and orderly condition. Remove all dirt and debris from the interior and exterior of all devices and equipment. After construction is completed, wash all light fixtures and lamps, remove all labels from fixture lenses.

1.11 DUST PROTECTION

A. Contractor will provide suitable dust protection for all existing areas prior to beginning of cutting or demolition. Contractor will obtain approval of partition from Owner before proceeding with work involved in these rooms.

1.12 TEMPORARY FACILITIES

A. OFFICES

1. Contractor shall provide temporary offices for himself including lights, heat and telephone, if required.

B. REMOVAL

1. Contractor shall completely remove his temporary installations when no longer needed and the premises shall be completely clean, disinfected, patched, and refinished to match adjacent areas.

C. LADDERS AND SCAFFOLDS

1. The contractor shall provide their own ladders, scaffolds, etc. of substantial construction for access to their work in various portions of the building as may be required. When no longer needed, they shall be removed by the contractor.

D. PROTECTION DEVICES

1. The contractor shall provide and maintain his own necessary barricades, fences, signal lights, etc. required by all governing authorities or shown on the drawings. When no longer needed, they shall be removed by the contractor. The contractor shall assume all responsibility for which the owner may be held responsible because of lack of above items.

E. TEMPORARY WATER

1. The contractor shall provide all water required by his trade for construction. Temporary drinking water shall be provided by contractor from a proven safe source dispensed by single service containers, until such time as the construction water outlet has been install, disinfected and approved for drinking purposes.

F. TEMPORARY FIRE PROTECTION

1. The contractor shall provide all necessary first-aid hand fire extinguishers for Class A, B, C and special hazards as may exist in his own work area only in accordance with good and safe practice and as required by jurisdictional safety authority. The contractor shall provide general area fire extinguishers only.

1.13 TEMPORARY ELECTRICAL FACILITIES

A. DESCRIPTION OF SYSTEM

1. Provide temporary electric power for items listed, throughout the construction period, so that power can be secured at any desired point from temporary service panel within building proper.

a. Power centers for miscellaneous tools and equipment used in the construction period, so that power can be secured at any desired point from temporary service panel within building proper.

b. Lighting for safe and adequate working conditions throughout the buildings, stairways, and crawl spaces. Provide at least 1/2 watt of incandescent lighting per square foot of floor area. Maintain a socket voltage of at least 110 volts. Use a minimum of 100-watt bulbs.

c. Power for construction site offices and for other temporary storage and construction buildings.

d. Power to maintain continuous construction during changeover of electrical equipment.

e. Power for testing and checking equipment.

B. CAPACITY

1. Provide and maintain adequate electrical power for construction use by all trades during the construction period at the locations necessary.

C. POWER COSTS

1. The contractor shall pay all cost of setting and removing temporary service.

D. USE OF PERMANENT SYSTEM

1. Regulate any part of the permanent electrical system which is used for construction purposes to prevent interference with safety and orderly progress of the work.

2. Leave permanent electrical services in a condition as good as new.

3. The permanent heating system is to be connected to the permanent power supply as soon as possible to provide heat to complete construction at no additional cost to Owner or Architect/Engineer.

4. The contractor will NOT be required to separately meter electrical power consumption used for construction purposes when using the building’s permanent electrical system.

1.14 ALTERATIONS

A. In alteration, extension, and remodeling projects, existing conduits shall be extended, altered or reconnected as shown or as directed. Where existing conduits which are indicated to be revised, or which will be essential to the functioning of the particular system, are cut or exposed due to construction changes, new connections shall be made in the most expeditious manner as directed or indicated. Where wiring is involved, new wires shall be pulled in between the nearest available, accessible, reused outlets. In all cases where new wires are required, indicated or specified to be installed in existing conduits, if same cannot be installed, new conduits shall be provided. Attention is called to the fact that all new conduit; wiring and apparatus shown on drawings or specified shall be connected to the existing systems so as to function as complete units. All conduits and electrical apparatus, etc., in place and not shown or specified to be reused or which will not be essential to the functioning of the various systems when the work is complete, shall be removed and stored where directed. No old material shall be reinstalled or reused unless otherwise indicated on drawings or herein specified. Concealed conduits which are not indicated or specified to be reused and become exposed due to construction changes shall be removed to the nearest available, accessible, reused outlets.

1.15 SHOP DRAWINGS

A. Provide electronic (pdf) copies of manufacturer's literature and/or certified prints as soon as possible but within thirty (30) days after awarding of Contract, for items of materials, equipment, or systems where called for in specifications. Shop drawings and literature complete showing item used, size, dimensions, capacity, rough in, etc., as required for complete check and installation. Manufacturers literature showing more than one item shall be clearly marked as to which item is being furnished or it will be rejected and returned without review.

B. Each copy of each item submitted must be clearly marked as follows for purposes of identification and record. Submittals not marked (typewritten only) as described below will be rejected and returned without review.

Date:
Name of Project:
Branch of Work:
Submitted by:
Specification or Plan Reference:

C. Prior to their submission, each submittal shall be thoroughly checked by the contractor for compliance with the Contract Document requirements, accuracy of dimensions, relationship to the work of other trades, and conformance with sound, safe practices as to erection and installation. Each submittal shall then bear a stamp evidencing such checking and shall show corrections made, if any. Submittals requiring extensive corrections shall be revised before submission. Each submittal not stamped and signed by the contractor evidencing such checking will be rejected and returned without review.

D. All submittals will be examined when submitted in proper form for compliance. Such review shall not relieve the contractor of responsibility for errors, for deviation from the contract Documents, nor for violation of sound safety practices.

E. The contractor shall keep in the field office one print of each submittal, which has been reviewed and stamped by the Architect or Engineer.

F. Submittals will be required for each item of material and equipment furnished as noted in specifications.

G. Submittals which are incomplete relative to quality requirements, capacity, engineering data, dimensional data or detailed list of specialty or control equipment will be rejected. Lists shall include descriptive coding as specified or shown on drawings.

H. Schedule of Shop Drawings.

ITEM	MFG LIT	SHOP DWG	WIRING DIAG.	O&M BOOK
RACEWAYS AND FITTINGS	X			
WIRE AND CABLE	X			
OUTLET BOXES	X			
CONTROLLERS	X	X	X	X
WIRING DEVICES	X			
SUPPORTING DEVICES	X			
FUSES	X			
DISCONNECT SWITCHES	X			
PANELBOARDS	X	X		
LIGHTING & LIGHTING CONTROL	X	X		

1.16 OPERATION AND MAINTENANCE MANUALS

A. At the time orders are placed for any item of equipment requiring service or operating maintenance, the contractor shall request the manufacturer furnish three (3) copies of OPERATION AND MAINTENANCE INSTRUCTIONS for each piece of equipment. These shall be included in the brochure of equipment.

1.17 BROCHURE OF EQUIPMENT

A. Upon completion of work, prepare a "Brochure of Equipment" containing data pertinent to equipment and systems on job. Binders containing materials shall be one or more three ring binders of sufficient number to hold all literature. Contained in binders shall

be: Installation, maintenance, and operating instructions for each piece of equipment; parts lists; wiring diagrams; one copy of each shop drawing and literature submittal; record drawings, etc.

B. All literature shall be clean, unused and filed under divider headings corresponding to the specifications.

C. These brochures shall be submitted to the Architect/Engineer and approved by him before authorization of final payment.

1.18 "AS-BUILT" DRAWINGS

A. The contractor shall furnish to the Owner and Architect/Engineer a red line marked print set of drawings, each sheet stamped as the "As-Built" drawing and bearing the contractor's name, date and signature. The As-Built drawing shall show the location of all concealed or underground conduit runs and other equipment, devices, outlets, etc., installed other than as shown on the drawings. Dimension underground lines from established building lines. As-Built drawings to be developed from a job site record drawing set and shall be clean, neat and all changes legible and shown in the same format and symbols used on the contract drawings. The As-Built drawing set shall be submitted to the architect/engineer for approval, and any deficiencies noted by the architect/engineer corrected and resubmitted until approved by the architect/engineer at no cost to architect/engineer or owner.

1.19 PLACING SYSTEMS IN OPERATION

A. At the completion of the work and at such time as the Owner shall direct, prior to final acceptance, the contractor performing this work shall put into satisfactory operation the various systems installed under the specifications. At no additional cost to the Owner, furnish the services of a person completely familiar with the installations performed under this specification, to instruct the Owners operating personnel in the proper operation and servicing of the equipment and systems. These services shall be available for a period of no less than one (1) day.

1.20 GUARANTEE-WARRANTY

A. This contractor shall and hereby does warrant and guarantee that all work executed under this Division will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of this work and that he will, at his own expense, repair and/or replace all such defective materials and work and all other work damaged thereby which becomes defective during the term of warranty, except that lamps and tubes shall be his responsibility only for normal lamp life or one year, whichever occurs first.

END OF SECTION 26 00 00

SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

1.02 REFERENCES

A. NECA (National Electrical Contractors Association) – Standard of Installation.

B. Division 07 – Thermal and Moisture Protection

C. Division 26 – Electrical

D. Section 26 05 26 – Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

E. Section 26 05 53 – Identification for Electrical Systems: Identification products and requirements.

F. Section 26 21 00 – Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

G. Division 31 – Earthwork

H. Section 31 2316 – Excavation.

I. Section 31 2316.13 – Trenching: Excavating, bedding, and backfilling.

J. Section 31 23 23 – Fill: Bedding and backfilling.

1.03 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:

1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
2. Stranded conductors for control circuits.
3. Conductor not smaller than 12 AWG for power and lighting circuits.
4. Conductor not smaller than 18 AWG for control circuits.
5. 10 AWG conductors for 20 ampere, 120 volt, branch circuit homeruns longer than 75 FEET.
6. 8 AWG conductors for 20 ampere, 120 volt, branch circuit homeruns longer than 150 FEET.

B. Wiring Methods: Provide the following wiring methods:

1. Interior Locations: Use only Type THHN/THWN in raceway.
2. Exterior Locations: Use only THW or direct burial cable in raceway.

3. Underground Locations: Use only Type THW, THHN/THWN or direct burial cable in raceway.
4. Increase raceway size where required to comply NEC raceway maximum fill requirement.

1.04 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper. Aluminum conductors are not acceptable unless noted otherwise.

1.05 SUBMITTALS

A. Section 26 00 00 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit for building wire.

C. Test Reports: Indicate procedures and values obtained.

1.06 CLOSEOUT SUBMITTALS

A. Section 26 00 00 – Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and circuits.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.08 FIELD MEASUREMENTS

A. Verify field measurements as indicated on Drawings.

1.09 COORDINATION

A. Division 1 – General Requirements.

B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

C. Wire and cable routing indicated is approximate unless dimensioned.

PART 2 - PRODUCTS

2.01 BUILDING WIRE

A. Manufacturers:

1. Diamond Wire & Cable Co. Model.
2. Essex Group Inc.
3. General Cable Co.
4. Southwire
5. Substitutions: Section 01 60 00 – Product Requirements.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

E. Insulation Temperature Rating: 75 degrees C.

F. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

G. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

1. Exceptions:

a. Use manufactured wiring systems for branch circuits where concealed under raised floors.

b. Use power and control tray cable or metal-clad cable for installation in cable tray.

H. Nonmetallic-sheathed cable is not permitted unless noted otherwise.

1. In addition to other applicable restrictions, may not be used:

a. Where exposed to view.

b. Where exposed to damage.

c. For damp, wet, or corrosive locations.

d. Underground locations.

I. Service entrance cables are permitted only as follows.

1. For underground service entrance, installed in raceway.

2. In addition to other applicable restrictions, may not be used:

a. Where exposed to damage.

J. Armored cable is not permitted.

1. In addition to other applicable restrictions, may not be used:

a. Unless approved by Owner.

b. Where not approved for use by the authority having jurisdiction.

c. Where exposed to view.

d. Where exposed to damage.

e. For damp, wet, or corrosive locations.

f. For isolated ground circuits.

K. Metal-clad cable is not permitted.

1. In addition to other applicable restrictions, may not be used:

a. Unless approved by Owner.

b. Where not approved for use by the authority having jurisdiction.

c. Where exposed to view.

d. Where exposed to damage.

e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

L. Manufactured wiring systems are permitted only as follows:

1. In addition to other applicable restrictions, may not be used:

a. Unless approved by Owner.

b. Where not approved for use by the authority having jurisdiction.

c. Where exposed to view.

d. Where exposed to damage.

e. For damp, wet, or corrosive locations.

f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.02 WIRING ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.

c. Substitutions: See Section 01 60 00 – Product Requirements.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Burndy LLC: www.burndy.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
      d. Substitutions: See Section 01 60 00 – Product Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. Ilsco: www.ilsco.com/#sle.
      d. Substitutions: See Section 01 60 00 – Product Requirements.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. American Polywater Corporation: www.polywater.com/#sle.
      c. Ideal Industries, Inc: www.idealindustries.com/#sle.
      d. Substitutions: See Section 01 60 00 – Product Requirements.

E. Cable Ties: Material and tensile strength rating suitable for application.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Substitutions: See Section 01 60 00 – Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify interior of building has been protected from weather.

B. Verify mechanical work likely to damage wire and cable has been completed.

C. Verify raceway installation is complete and supported.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Install wire and cable in accordance with NECA "Standard of Installation."

C. Neatly train and lace wiring inside boxes, equipment, and panelboards.

D. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

E. Special Techniques – Building Wire in Raceway:

1. Pull conductors into raceway at same time.

2. Install building wire 4 AWG and larger with pulling equipment.

F. Special Techniques – Cable:

1. Protect exposed cable from damage.

2. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

3. Use suitable cable fittings and connectors.

G. Special Techniques – Wiring Connections:

1. Clean conductor surfaces before installing lugs and connectors.

2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.

4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.

5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

7. Install solid conductor for feeders and branch circuits 10 AWG and smaller.

8. Install stranded conductors for branch circuits 8 AWG and larger. However, when stranded conductors are used in lieu of solid, then install crimp-on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

3.04 WIRE COLOR

A. General

1. Color-code 208/120-V, 240/120-V system secondary, feeder, and branch-circuit conductors throughout the secondary electrical system as follows. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:

Description	**120/240V**	**120/208V**	**277/480V**	**Control**
Phase A (Left)	Black	Black	Brown	-----
Phase B (Center)	Red	Red	Orange	-----
Phase C (Right)	-----	Blue	Yellow	-----
Neutral	White	White	Gray	White
Ground	Green	Green	Green	Green
120 VAC Control	-----	-----	-----	Red
120 VAC Control	-----	Neutral	-----	White
DC Control (+)	-----	-----	-----	Blue
DC Control (-)	-----	-----	-----	Gray
External Source	-----	-----	-----	Yellow

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:

1. For 6 AWG and smaller: Green.

2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.05 FIELD QUALITY CONTROL

A. Section 00 14 00 – Quality Requirements: Testing and inspection services;

B. Section 01 70 00 – Execution Requirements: Testing, adjusting, and balancing.

C. Inspect and test system in accordance with manufacturer's recommendations and industry standards. System shall be free of all unnecessary shorts and insulation or conductor damage.

END OF SECTION 26 05 19

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

PART 2 - PRODUCTS

2.01 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 05 19 Section – Conductors and Cable.

B. Material: Copper only.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.02 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

PART 3 - EXECUTION

3.01 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated copper equipment grounding conductors.

3.02 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Signal and Communication Systems: For telephone, television, alarm, voice and data, and other communication systems, provide insulated grounding conductor in raceway with all equipment branch circuits. Verify existing equipment ground back to grounding electrode system is present and functional. Notify Engineer if any problem with equipment branch circuits or grounding system is observed.

3.03 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

B. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.

END OF SECTION 26 05 26

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Raceways include the following:

a. RMC – Rigid Metal Conduit.

b. IMC – Intermediate Metal Conduit.

c. PVC externally coated, rigid steel conduits.

d. PVC externally coated, IMC.

e. EMT – Electrical Metallic Tubing.

f. FMC – Flexible Metal Conduit.

g. LFMC – Liquidtight Flexible Metal Conduit.

h. RNC – Rigid Non-Metallic Conduit.

i. Wireways.

j. Surface raceways.

2. Boxes, enclosures, and cabinets include the following:

a. Device boxes.

b. Outlet boxes.

c. Pull and junction boxes.

d. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:

1. Division 07 – Thermal and Moisture Protection

2. Division 26 – Electrical

3. Section 26 27 26 – Wiring Devices, for devices installed in boxes and for floor-box service fittings.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RMC: Rigid metal conduit.

F. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

D. Plastic-Coated IMC and Fittings: NEMA RN 1.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type - steel. Cast fittings are not acceptable.

F. LFMC: Liquid-tight flexible steel conduit with PVC jacket.

G. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.02 NONMETALLIC CONDUIT

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit type and material.

2.03 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.04 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

C. Non-metallic Floor Boxes: Carlon E971FB

2.05 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.06 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

2.07 SURFACE RACEWAYS

A. Types, sizes, and channels as indicated on the floor plans, with fittings that match and mate with raceways.

B. Manufacturer

1. The surface metal raceway specified herein shall be either G4000 gray or V4000 ivory finish as stated on approval drawings and manufactured by The Wiremold Company. Systems of other manufacturers may be considered if equal, by written approval of the specifying engineer and shall meet all the performance standards specified herein.

C. Materials

1. The raceway and all the system components must be UL Listed. Steel shall be galvanized. Finish may be either gray or ivory ScuffCoat™ (a polyester topcoat over ivory base) and shall be suitable for field repainting to match surroundings.

2. Raceway

a. The raceway shall be of a two-piece design with a metal base and snap-on metal cover. Base shall be a minimum of 0.050" wall thickness and cover shall be a minimum of 0.040" wall thickness. Assembled base and cover shall be 4.750" wide by 1.750" high with a cross-section area of 7.50 square inches. Base shall be dividable by means of a removable barrier section into two equal

compartments. A cutting tool shall be available for the base and cover to ensure clean, square cuts.

b. A full line of fittings must be available including but not limited to flat, internal and external elbows, couplings for joining raceway sections, wire clips, blank end fitting and a full compliment of device mounting brackets and plates. The fittings shall be colored to match the raceway.

3. Fiber Optic/UTP/STP Radius Full Capacity Fittings And Inserts

a. A complete line of full capacity corner elbows and tee fittings must be available to maintain a controlled 2" cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

b. A series of inserts shall also be available for retrofit applications that provide a controlled 2" cable bend radius which meets the specifications for Fiber optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

4. Device Brackets and Plates

a. Device brackets shall be available to install single or two-gang devices either horizontal or vertical within the raceway. Horizontal device brackets to be provided with a single two-gang or a single four-gang cover plate. Horizontal device mounting brackets are to be a single piece with two integral auxiliary grounding points provided. Horizontal device brackets to have option to be provided with receptacles pre-mounted from the factory with wire leads. Devices both power and data/communication shall have the capacity of mounting flush or in conjunction with faceplates. Faceplates to conceal seam between raceway cover and installed faceplate. Device brackets and plates shall be colored to match the raceway and available with any combination of multiple device opening options.

5. Plastic Overlapping Cover Bracket and Faceplates

a. A plastic device mounting bracket and trim plate shall be available to install devices horizontally. Trim plate shall overlap cover-eliminating seam. Faceplates shall be available to accept a variety of power and data/communication devices. Plastic must be compatible with UL 94 for Plastic Materials.

6. Communication Devices and Accessories

a. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP, STP (150 ohm), fiber optic, coaxial, and other cabling types with faceplates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available.

D. FITTINGS

1. A full complement of fittings must be available including, but not limited to flat, internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, c-hangers and end caps. The fittings shall be ivory, gray or custom colors to match the raceway. All fittings shall be supplied with a base where applicable to eliminate mitering.
2. Take-off fitting shall be available to adapt to existing flush wall boxes and to other series raceways manufactured by The Wiremold Company.

E. EXPLOSION-PROOF COUPLINGS

1. Couplings in explosion-proof environments shall be watertight, dust-ignition proof, and rated for hazardous locations where threaded metal conduit is used.
2. O-Z/Gedney ECGJH series, or equivalent.
3. O-Z/Gedney Type EYF conduit sealing fitting, or equivalent.
4. O-Z/Gedney Type UNF conduit unions, or equivalent.

F. EXPLOSION-PROOF OUTLET BOXES

1. Outlet boxes in explosion-proof environments shall be dust-ignition proof and rated for hazardous locations.
2. O-Z/Gedney Type GUA, Form 1 series conduit outlet boxes and covers, or equivalent.
3. O-Z/Gedney Type OELB conduit outlet bodies, or equivalent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel or IMC. (Only where use and location approved by architect prior to installation.)
2. Concealed: Rigid steel or IMC. (All finished areas)
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Indoors: Use the following wiring methods:

1. Exposed: EMT or IMC. (All finished areas)

2. Concealed: None. All raceway shall be exposed on the surface of the walls.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): use LFMC.

4. Damp or Wet Locations: Rigid steel conduit.

5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.

3.03 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Minimum Raceway Size: 3/4-inch trade size.

1. 1/2-inch trade size is acceptable for control wiring conduit.

C. Expose conduit and EMT, unless otherwise indicated, on finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceways.

H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

J. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

K. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

L. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

M. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

N. Join raceways with fittings designed and approved for the purpose and make joints tight.
1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

O. Tighten set screws of threadless fittings with suitable tools.

P. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

Q. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

R. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

S. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

T. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

U. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

V. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid-tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

W. Install nonferrous conduit or tubing for circuits operating above 60 Hz.

X. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

Y. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.

2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.

3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.

4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

Z. Set floor boxes level and adjust to finished floor surface.

AA. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.05 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 26 05 33

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.
6. Underground Warning Tape.
7. Lockout Devices.

1.02 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

B. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.03 CLOSEOUT SUBMITTALS

A. See Requirements for submittals in General Requirements section.

B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Refer to General Specification Product Requirements for requirements for transporting, handling, storing, and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Refer to General Requirements Section for environmental conditions affecting products on site.

B. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Manufacturers:

1. Brady

2. Substitutions: Section 26 00 00 – Product Requirements

B. Product Description: Laminated three-layer plastic with engraved black letters on contrasting background color.

C. Letter Size:

1. 1/8 inch high letters for identifying individual equipment and loads.

2. 1/4 inch high letters for identifying grouped equipment and loads.

D. Minimum nameplate thickness: 1/8 inch.

2.02 LABELS

A. Manufacturers:

1. Brady

2. Substitutions: Section 26 00 00 – Product Requirements

B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.03 WIRE MARKERS

A. Manufacturers:

1. Brady

2. Substitutions: Section 26 00 00 – Product Requirements.

B. Description: Split sleeve or tubing type wire markers.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number.

2. Control Circuits: Control wire number as indicated on Drawings. Description: Nameplate fastened with adhesive.

D. Color:

1. 208 Volt System: Black lettering on white background.
2. 240 Volt System: Black lettering on white background.
3. Fire Alarm System: Red lettering on white background.
4. Telephone System: Blue lettering on white background.
5. Security System: Yellow lettering on white background.

E. Legend:

1. 480 Volt System: 480 VOLTS.
2. Fire Alarm System: FIRE ALARM.

2.04 UNDERGROUND WARNING TAPE

A. Description: 4” wide plastic tape, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 EXISTING WORK

A. Install identification on existing equipment to remain in accordance with this section as noted on Drawings.

B. Replace lost nameplates, labels, or markers.

3.03 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws, rivets, or adhesive.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.

6. Install nameplates for the following:
    a. Switchboards.
    b. Panelboards.
    c. Service Disconnects.
    d. Motor Starters.

C. Label Installation:
    1. Install label parallel to equipment lines.
    2. Install label for identification of individual control device stations.
    3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:
    1. Install wire marker for each conductor at panelboard gutters and each load connection.
    2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
    3. Install labels at data outlets identifying patch panel and port designation.

E. Underground Warning Tape Installation:
    1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION 26 05 53

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Division 26 – Electrical

B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

C. Section 26 05 53 – Identification for Electrical Systems: Identification products and requirements.

D. Section 26 28 13 – Fuses: Fuses for fusible switches and spare fuse cabinets.

1.03 REFERENCE STANDARDS

A. FS W-C-375 – Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 – Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 – Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA ICS 2 – Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

F. NEMA KS 1 – Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 1 – Panelboards; 2011.

H. NEMA PB 1.1 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

I. NETA ATS – Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

J. NFPA 70 – National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 – Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E – Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 – Panelboards; Current Edition, Including All Revisions.

N. UL 98 – Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 – Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A – Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 – Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 – Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

S. UL 1699 – Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation of listed series ratings upon request.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 – Product Requirements, for additional provisions.
2. Panelboard Keys: Two of each different key.
3. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

2. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation

B. Schneider Electric; Square D Products

C. Siemens Industry, Inc

D. Substitutions: See Section 01 60 00 – Product Requirements.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS – GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location.

3. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.

4. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.

3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

c. Provide removable end walls for NEMA Type 1 enclosures.

d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

L. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.

1. Ampere Rating: Not less than ampere rating of panelboard bus.

2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.

3. Coil Voltage: As required for connection to control system indicated.

M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

N. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

O. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

P. Load centers are not acceptable.

Q. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.

2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.

2. Ground Bus Material: Aluminum.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

2. Provide thermal magnetic circuit breakers unless otherwise indicated.

3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

4. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

5. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
4. Provide clear plastic circuit directory holder mounted on inside of door.

F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

2.05 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Products:

1. NOTE: Load Centers are only acceptable by written permission from the engineer.
2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Aluminum or copper.

D. Circuit Breakers: Thermal magnetic plug-in type.

E. Enclosures:

1. Provide flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide cover without door to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
3. Fronts: Provide hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

4. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Fusible Switches:

1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

2. Fuse Clips: As required to accept indicated fuses.

a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

4. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Provide compression lugs where indicated.

c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

B. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

i. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

ii. 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Provide compression lugs where indicated.

c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

   b. Provide interchangeable trip units where indicated.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

   a. Provide the following field-adjustable trip response settings:

      i. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

      ii. Long time delay.

      iii. Short time pickup and delay.

      iv. Instantaneous pickup.

      v. Ground fault pickup and delay where ground fault protection is indicated.

   b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.

   c. Provide communication capability where indicated: Compatible with system indicated.

6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:

   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

   e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle

wave of the symmetrical prospective current when operating within its current limiting range.

8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
10. Do not use tandem circuit breakers.
11. Do not use handle ties in lieu of multi-pole circuit breakers.
12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
13. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
    c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
    d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
    e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 40 00 – Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required supports in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

K. Provide grounding and bonding in accordance with Section 26 05 26.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

L. Install all field-installed branch devices, components, and accessories.

M. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

N. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

O. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

P. Set field-adjustable circuit breaker tripping function settings as indicated.

Q. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

R. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

S. Provide filler plates to cover unused spaces in panelboards.

T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

1. Emergency and night lighting circuits.

2. Fire detection and alarm circuits.

3. Communications equipment circuits.

4. Intrusion detection and access control system circuits.
5. Video surveillance system circuits.

U. Identify panelboards in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.

1. Perform insulation-resistance tests on all control wiring with respect to ground.
2. Test functions of the trip unit by means of secondary injection.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Test GFCI circuit breakers to verify proper operation.

G. Test AFCI circuit breakers to verify proper operation.

H. Test shunt trips to verify proper operation.

I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

SECTION 26 27 13
ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes coordination with Mission Valley Power for installation of underground electric secondary lines.

1.02 SYSTEM DESCRIPTION

A. Primary Service Owner: MISSION VALLEY POWER

B. System Characteristics: three-phase, secondary, underground, electrical line.

C. Scope:

1. Provide a new electrical service line from the existing utility transformer near the Sewage Treatment Plant to the new MBR Treatment Facility. Refer to site civil and electrical plans. All service costs, both temporary and permanent, shall be included in the Contractor's bid pricing.

1.03 SUBMITTALS

A. Section 26 00 00 - Submittal Procedures.

B. Submit Utility-Company-prepared drawings.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with Mission Valley Power written requirements.

B. Maintain one copy of each document on site.

1.05 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.06 COORDINATION

A. Coordinate with Mission Valley Power the installation of a new electrical service line to the Treatment Facility from their existing utility transformer.

B. The Contractor shall pay for all costs that will be associated with work performed to provide the new electrical service; such costs are part of this contract.

PART 2 - PRODUCTS

2.01 UTILITY METERS

A. Furnished by Utility Company.

2.02 UTILITY METER BASE & CT CANS

A. Furnished by Electrical Contractor per utility company standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify service equipment is ready to be connected and energized.

3.02 INSTALLATION

A. Contractor shall provide all trenching, conduit, CT can, meter socket base, and service entrance disconnects. Mission Valley Power shall install the service entrance conductors from the transformer to the building service entrance equipment (located by the transformer), current transformers, and meter. Mission Valley Power shall connect service entrance conductors from the utility transformer to the incoming side of the CT can. The contractor shall connect the service entrance conductors from the outgoing side of the CT can to the main service disconnect and beyond. Coordinate all electrical outages with Mission Valley Power.

END OF SECTION 26 27 13

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.03 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.04 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates; floor box cut-sheets.

C. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.06 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.02 RECEPTACLES

A. Straight-Blade Receptacles: Specification grade, Heavy-Duty, 5-20R duplex receptacle, 120VAC, 20 amp. Hubbell #HBL 5362, Leviton #5362 or equal. Construction grade not acceptable. CR Series not acceptable.

B. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit.

Design units for installation in a 2-3/4-inch deep outlet box without an adapter. Hubbell #HBL GF5362, Leviton #7899, or equal.

C. GFCI Receptacles (Exterior): Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch deep outlet box without an adapter. Heavy duty, commercial grade, tamper and weather resistant, 20 Amp, 125VAC. Leviton or equivalent.

2.03 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.04 SWITCHES

A. General A/C Switches: Specification grade, Heavy-duty, quiet type, toggle type, 120-277 VAC, 20 amp. Leviton CSB series or equal.

B. Occupancy Sensor Switches: Refer to Occupancy Sensor Schedule on the drawings for description, manufacturer, and part number.

2.05 WALL PLATES

A. Single and combination types match corresponding wiring devices.

1. Material: Stainless Steel. Configuration to match devices and device ganging. Leviton or equal.

2.06 FINISHES

A. Color: Gray

2.07 EXPLOSION PROOF DEVICES

A. Devices in explosion-proof environments shall be factory sealed, dust-ignition proof, and rated for hazardous locations where used.

B. Appleton EFD/EFDC series control stations, or equivalent.

C. Appleton U-Line Contender series, Type ENR receptacle, 20 Amp, 125Vac, or equivalent.

D. Appleton U-Line Interchanger series, Type ECP plug, 20 Amp, 125 Vac, or equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

D. Protect devices and assemblies during painting.

3.02 CONNECTIONS

A. Connect wiring device grounding terminal to outlet box with bonding jumper.

B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

C. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.04 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 26 27 26

SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, controllers, and spare fuses.

1.03 SUBMITTALS

A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations: Provide fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

B. Fuse shall be approved for use for the application’s actual voltage, ampere, and short circuit characteristics. Verify all fuse size indications on the drawings with actual nameplate ratings and install the appropriate fuse size for the application according to the NEC.

PART 2 - PRODUCTS

2.01 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK5, time delay.

B. Other Branch Circuits: Class RK5, time delay.

3.03 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.04 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

SECTION 26 28 16
ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes fusible and non-fusible switches.

B. Related Sections:

1. Section 26 28 13 – Fuses.

1.02 REFERENCES

A. NECA (National Electrical Contractors Association) – Standard of Installation.

B. NEMA FU 1 (National Electrical Contractors Association). – Low Voltage Cartridge Fuses.

C. NEMA KS 1 (National Electrical Contractors Association). – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

1.03 SUBMITTALS

A. Section 26 0000 – Submittal Procedures: Submittal procedures.

B. Product Data: Submit switch ratings and enclosure dimensions.

PART 2 - PRODUCTS

2.01 FUSIBLE SWITCH ASSEMBLIES

A. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle shall be lockable in the ON and OFF position.

B. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.

C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray.

1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R.

D. Furnish switches with entirely copper current carrying parts.

2.02 NONFUSIBLE SWITCH ASSEMBLIES

A. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle shall be lockable in the ON and OFF position.

B. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray.

1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R.
3. Corrosive environments: Type 4X.

C. Furnish switches with entirely copper current carrying parts.

2.03 SWITCH RATINGS

A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating: UL listed for 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install enclosed switches plumb. Provide supports in accordance with Section 26 05 33.

C. Height: 42” or as scheduled.

D. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.

E. Install engraved plastic nameplates in accordance with Section 26 05 33.

F. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

G. Ensure that all handles, switches, knobs, buttons, etc. are easily accessible and operational.

3.02 FIELD QUALITY CONTROL

A. Inspect and test for proper installation and operation.

END OF SECTION 26 28 16

SECTION 26 32 13
STANDBY POWER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF SYSTEM & SITE

A. Provide a 100 kW standby power system to supply electrical power at 208Y/120 Volts, 60 Hertz, three phase for two locations: the lift station building and the new treatment facility. The single generator shall consist of a liquid cooled, industrial, diesel fueled engine, a synchronous AC alternator, and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.

B. The generator site is an NEC ordinary location with no specific harsh environment requirements.

C. The genset shall be applied at the listed ambient temperature and elevation. Bidders shall submit the generator's rated power output at 104 ambient (˚F) and 3,000 elevation (Ft).

D. Bidders are to submit the genset's sound level no greater than 78 in dBA at 23 ft based on the configuration specified.

E. The Engine-Generator Set (Genset) shall be capable of starting the following loads for the Lift Station:

1. Two 5 HP, 208V, 3-phase motors (code G)
2. Two 2 HP, 208V, 3-phase motors (code G)
3. 4 kW of heating load
4. 2.1 kW exhaust fan
5. 0.76 kW of miscellaneous load for lighting, receptacles, and other equipment.
6. Voltage dip shall not exceed 20%.

F. The Engine-Generator Set (Genset) shall be capable of starting the following loads for the Treatment Facility:

1. Four 2 HP pumps
2. Three 1 HP water pumps
3. Two 0.33 HP pumps
4. Two 0.5 HP pumps
5. One 5 HP pump
6. One 7 HP pump
7. 15.84 kW of heating load
8. 1.8 kW Control Panel

9. 2.2 kW of miscellaneous load for lighting, receptacles, and other equipment.
10. Voltage dip shall not exceed 20%.

1.02 REQUIREMENTS FOR REGULATORY AGENCIES

A. An electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.

B. The generator set must conform to applicable NFPA requirements.

C. The generator set must be available with the Underwriters Laboratories listing (UL2200) for a stationary engine generator assembly.

D. The generator set must meet EPA federal emission guidelines for stationary standby power generation.

1.03 MANUFACTURER QUALIFICATIONS

A. This system shall be manufactured by Generac Power Systems, Waukesha, WI, or a pre-approved equal.

B. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.

C. Manufacturer's authorized service representative shall meet the following criteria:

1. Certified, factory trained, industrial generator technicians
2. Service support 24 hours a day, 7 days a week.
3. Service location within 125 miles.
4. Response time of 2 hours.
5. Service & repair parts in-stock at performance level of 95%.
6. Offer optional remote monitoring and diagnostic capabilities.

D. SUBMITTALS
Engine Generator specification sheet

E. Controls specification sheet(s)

F. Installation / Layout dimensional drawing

G. Wiring schematic

H. Sound data

I. Emission certification

J. Warranty statement

PART 2 - PRODUCTS

2.01 GENSET ENGINE RATING AND PERFORMANCE

A. The prime mover shall be a liquid cooled, diesel fueled, turbocharged after-cooled engine of 4-cycle design. It will have adequate horsepower to achieve a rated output of 100 kW, with an operating speed of 1800 RPM.

B. The engine shall support a 100% load step.

C. The generator system shall support generator start-up and load transfer within 10 seconds.

D. The generator shall accept a load step of 25 kW with a maximum frequency dip of 5 Hz.

E. ENGINE OIL SYSTEM
Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).

F. The engine shall operate on mineral based oil. Synthetic oils shall not be required.

G. The oil shall be cooled by an oil cooler which is integrated into the engine system.

H. The engine oil pan will contain a 120vac thermostatically controlled crankcase oil heater.

2.02 ENGINE COOLING SYSTEM

A. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system. The coolant system shall include a coolant fill box which will provide visual means to determine if the system has adequate coolant level. The radiator shall be designed for operation in 122 degrees F, ambient temperature.

B. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer. The wattage shall be upsized to support very cold environments.

C. Engine coolant and oil drain extensions, equipped with pipe plugs and shut-off valves, must be provided to the outside of the mounting base for cleaner and more convenient engine servicing.

D. A radiator fan guard must be installed for personnel safety that meets UL and OSHA safety requirements.

2.03 ENGINE STARTING SYSTEM

A. Starting shall be by a solenoid shift, DC starting system.

B. The engine’s cranking batteries shall be lead acid. The batteries shall be sized per the manufacturer’s recommendations. The batteries shall be the largest available by the manufacturer for this generator size. The batteries supplied shall meet NFPA 110 cranking requirements of 90 seconds of total crank time. Battery specifications (type, amp-hour rating, cold cranking amps) to be provided in the submittal.

C. The genset shall have an engine driven, battery charging alternator with integrated voltage regulation.

D. The genset shall have an automatic dual rate, float equalize, 10 amp battery charger. The charger must be protected against a reverse polarity connection. The chargers charging current shall be monitored within the generator controller to support remote monitoring and diagnostics. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

E. Thermostatically controlled battery blanket heaters are to be provided to maximize the batteries cold cranking capabilities.

2.04 ENGINE FUEL SYSTEM

A. The engine fuel system shall be designed for operation on diesel fuel.

B. The genset shall include a secondary duplex fuel filter assembly capable of switching filters without shutting down the engine. The filter shall remove contaminants of 10 microns or larger.

C. The genset shall include a secondary fuel filter with an electric fuel heating element sized to increase the fuel temperature 40 degrees F with the engine at 75% load.

2.05 ENGINE CONTROLS

A. Engines that are equipped with an electronic engine control module (ECM), shall monitor and control engine functionality and seamlessly integrate with the genset controller through digital communications. ECM monitored parameters shall be integrated into the genset controllers NFPA 110 alarm and warning requirements. All ECM fault codes shall be displayed at the genset controller in standard language – fault code numbers are not acceptable.

B. For engines without ECM functionality or for any additional genset controller monitoring, sensors are to be conditioned to a 4-20ma signal level to enhance noise immunity and all sensor connections shall be sealed to prevent corrosion.

C. Engine speed shall be controlled with an integrated isochronous governor function with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.

2.06 ENGINE EXHAUST INTAKE

A. The engine exhaust emissions shall meet the EPA emission requirements for standby power generation.

B. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system. A rain cap will terminate the exhaust pipe after the silencer. All components must be properly sized to assure operation without excessive back pressure when installed.

C. The manufacturer shall supply a critical grade exhaust silencer as standard. For applications with site specific sound requirements (reference section 1.1), the silencer shall be selected to achieve site sound levels.

D. For gensets in a weather or sound attenuated enclosure, all exhaust piping from the turbo-charger discharge to the silencer shall be thermally wrapped to minimize heat dissipation inside the enclosure.

E. The engine intake air is to be filtered with engine mounted, replaceable, dry element filters.

2.07 ALTERNATOR

A. The alternator shall be the voltage and phase configuration as specified in section 1.01.

B. The alternator shall be a 4 pole, revolving field, stationary armature, synchronous machine. The excitation system shall utilize a brushless exciter with a three phase full wave rectifier assembly protected against abnormal transient conditions by a surge protector. Photo-sensitive components will not be permitted in the rotating exciter.

C. The alternator shall include a permanent magnet generator (PMG) for excitation support. The system shall supply a minimum short circuit support current of 300% of the rating for 10 seconds.

D. For proper motor starting for this specific project, the alternator shall be up sized and to support a maximum voltage dip of 20%. Documentation shall be submitted to verify this rating.

E. Three phase alternators shall be 12 lead, broad range capable of supporting voltage reconnection. All leads must be extended into a NEMA 1 connection box for easy termination. A fully rated, isolated neutral connection must be included by the generator set manufacturer.

F. The alternator shall use a single, sealed bearing design. The rotor shall be connected to the engine flywheel using flexible drive disks. The stator shall be direct connected to the engine to ensure permanent alignment.

G. The alternator shall meet temperature rise standards of UL2200 (120 degrees C). The insulation system material shall be class "H" capable of withstanding 150 degrees C temperature rise.

H. The alternator shall be protected against overloads and short circuit conditions by advanced control panel protective functions. The control panel is to provide a time current algorithm that protects the alternator against short circuits. To ensure precision protection and repeatable trip characteristics, these functions must be implemented electronically in the generator control panel -- thermal magnetic breaker implementation are not acceptable.

2.08 CONTROLS

A. The generator control system shall be a fully integrated microprocessor based control system for standby emergency engine generators meeting all requirements of NFPA 110 level 1.

B. The generator control system shall be a fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions including: engine protection, alternator protection, speed governing, voltage regulation and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped. Generator controller's that utilize separate voltage regulators and speed governors or do not provide seamless integration with the engine management system are considered less desirable.

C. Communications shall be supported with building automation via the Modbus protocol without network cards. Optional internet and intranet connectivity shall be available.

D. The control system shall provide an environmentally sealed design including encapsulated circuit boards and sealed automotive style plugs for all sensors and circuit board connections. The use of non-encapsulated boards, edge cards, and pc ribbon cable connections are considered unacceptable.

E. Circuit boards shall utilize surface mount technology to provide vibration durability. Circuit boards that utilize large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

F. A predictive maintenance algorithm that alarms when maintenance is required. The controller shall have the capability to call out to the local servicing dealer when maintenance is required.

G. Diagnostic capabilities should include time-stamped event and alarm logs, ability to capture operational parameters during events, simultaneous monitoring of all input or output parameters, callout capabilities, support for multi-channel digital strip chart functionality and .2 msec data logging capabilities.

H. In addition to standard NFPA 110 alarms, the application loads should also be protected through instantaneous and steady state protective settings on system voltage, frequency, and power levels.

I. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option.

J. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. In addition, custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.

K. The control panel will display all user pertinent unit parameters including: engine and alternator operating conditions; oil pressure and optional oil temperature; coolant temperature and level alarm; fuel level (where applicable); engine speed; DC battery voltage; run time hours; generator voltages, amps, frequency, kilowatts, and power factor; alarm status and current alarm(s) condition.

L. The control panel shall display all pertinent unit parameters including:

1. Generator Status
2. Current unit status in real time
3. Engine operating conditions
4. Real time readouts of the engine and alternator values
    a. Oil pressure and optional oil temperature
    b. Coolant temperature and level
    c. Fuel level (where applicable)
    d. Engine speed
    e. DC battery voltage
    f. Run time hours
    g. Generator voltages, amps, frequency
    h. Power factor
5. Generator Commands
    a. Current engine start/stop status
6. Alarm Status
    a. Current alarm(s) condition
    b. Low or high AC voltage
    c. Low or high battery voltage
    d. Low or high frequency
    e. Pre-low or low oil pressure
    f. Pre-high or high oil temperature (optional)
    g. Low water level and temperature
    h. Pre-high or high engine temperature
    i. High, low and critical low fuel levels (where applicable)
    j. Overcrank
    k. Over and under speed
    l. Unit not in "Automatic Mode"

7. Alarm Log
    a. Memory of last twenty alarm events (date and time stamped)

2.09 ENGINE/ALTERNATOR PACKAGE

A. The engine/alternator shall be isolated from the generator frame with rubber isolators. The packaging shall not require the addition of external spring isolators.

B. One mainline thermal magnetic [electronic LSI] circuit breaker carrying the UL mark shall be factory installed. The breaker shall be rated at 400 Amps. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections.

C. The generator shall include a unit mounted 120 volt convenience outlet.

2.10 ENCLOSURE

A. The genset shall be packaged with a sound attenuating, weatherproof, weather protective enclosure.

B. The enclosure shall be completely lined with sound deadening material. This material must be of a self-extinguishing design.

C. The enclosure shall be made of steel with a minimum thickness of 14 gauge. The enclosure is to have hinged, removable doors to allow access to the engine, alternator and control panel. The hinges shall allow for door fit adjustment. Hinges and all exposed fasteners will be stainless steel or JS5000. The use of pop-rivets weakens the paint system and not allowed on external painted surfaces. Each door will have lockable hardware with identical keys.

D. The enclosure shall be coated with electrostatic applied powder paint, baked and finished to manufacturer's specifications. The color will be manufacturer’s tan standard.

E. The enclosure shall utilize an upward discharging radiator hood. Due to concerns relative to radiator damage, circulating exhaust, and prevailing winds, equipment without a radiator discharge hood will not be acceptable.

F. The genset silencer shall be mounted on the discharge hood of the enclosure. Due to architectural concerns, silencers mounted on the top of the generator enclosure are not acceptable. Gensets with silencers mounted inside the main generator compartment are acceptable only if the silencer is thermally wrapped to minimize heat stress on the surrounding components.

G. The enclosure shall include a thermostatically controlled space heater designed to maintain the enclosure at 40 degrees F.

H. The fuel tank shall include a fuel spill box with spill sensor, automatic overflow fill valve, and the normal vent elevated 12 feet above grade.

2.11 SPARE PARTS

A. Provide one spare filter for each air, fuel, and oil.

2.12 AUTOMATIC TRANSFER SWITCH

A. The automatic transfer switch shall be furnished by the manufacturer of the engine-generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system. It shall be listed by Underwriter's Laboratory, Standard 1008 with circuit breaker protection. Representative production samples of the transfer switch supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is the electrically operated transfer from normal to emergency and back to normal. Wiring must comply with NEC table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular automatic transfer switch and a typical wiring diagram for the entire system.

B. The automatic transfer switch shall be a 3 pole design rated for 400 amps continuous operation in ambient temperatures of -20 degrees Fahrenheit to +140 degrees Fahrenheit. Main power switch contacts shall be rated for 600 V AC minimum. The transfer switch supplied shall have a minimum withstand and closing rating when fuse protected of 200,000 amperes. Where the line side overcurrent protection is provided by circuit breakers, the short circuit withstand and closing ratings shall be 25,000 amperes RMS. These RMS symmetrical fault current ratings shall be the rating listed in the UL listing or component recognition procedures for the transfer switch. All withstand tests shall be performed with the overcurrent protective devices located external to the transfer switch.

C. The transfer switch shall be double throw construction, positively electrically and mechanically interlocked to prevent simultaneous closing and mechanically held in both normal and emergency positions. Independent break before make action shall be used to positively prevent dangerous source to source connections. When switching the neutral, this action prevents the objectionable ground currents and nuisance ground fault tripping that can result from overlapping designs. The transfer switch shall be approved for manual operation. The electrical operating means shall be by electric solenoid. Every portion of the contactor is to be positively mechanically connected. No clutch or friction drive mechanism is allowed, and parts are to be kept to a minimum. This transfer switch shall not contain integral overcurrent devices in the main power circuit, including molded case circuit breakers or fuses.

D. The transfer switch electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching. Maximum electrical transfer time in either direction shall be 160 milliseconds, exclusive of time delays. Main switch contacts shall be high pressure silver alloy with arc chutes to resist burning and pitting for long life operation.

E. All control equipment shall be mounted on the inside of the cabinet door in a metal lockable enclosure with transparent safety shield to protect all solid state circuit boards. This will allow for ease of service access when main cabinet lockable door is open, but to prevent access by unauthorized personnel. Control boards shall have installed cover plates to avoid shock hazard while making control adjustments. The solid state voltage sensors and time delay modules shall be plug-in circuit boards with silver or gold contacts for ease of service.

F. A solid state undervoltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs. Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage. A utility sensing interface shall be used, stepping down system voltage of 120/208 VAC 3 phase to 24 VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.

G. Signal the engine-generator set to start in the event of a power interruption. A set of contacts shall close to start the engine and open for engine shutdown. A solid state time delay start, adjustable, .1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.

H. Transfer the load to the engine-generator set after it reached proper voltage, adjustable from 70-90% of system voltage, and frequency, adjustable from 80-90% of system frequency. A solid state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the engine-generator to warm-up before application of load. There shall be a switch to bypass this warm-up timer when immediate transfer is required.

I. Retransfer the load to the line after normal power restoration. A return to utility timer, adjustable from 1-30 minutes, shall delay this transfer to avoid short term normal power restoration.

J. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred. Controls shall provide an automatic retransfer of the load from emergency to normal if the emergency source fails with the normal source available.

K. Signal the engine-generator to stop after the load retransfers to normal. A solid state engine cooldown timer, adjustable from 1-30 minutes, shall permit the engine to run unloaded to cooldown before shutdown. Should the utility power fail during this time, the switch will immediately transfer back to the generator.

L. Provide an engine minimum run timer, adjustable from 5-30 minutes, to ensure an adequate engine run period.

M. Provide a solid state plant exercise clock. It must allow selection of any combination of days of the week and the time of day for the generator set exercise period. Clock shall have a one week cycle and be powered by the load side of the transfer switch. A battery must be supplied to maintain the circuit board clock operation when the load side of the transfer switch is de-energized. Include a switch to select if the load will transfer to the engine-generator set during the exercise period.

N. The transfer switch shall have a time delay neutral feature to provide a time delay, adjustable from .1-10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle. A switch will be provided to bypass all transition features when immediate transfer is required.

O. The transfer switch shall have an in-phase monitor which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of transfer initiation signal. A switch must be provided to bypass this feature if not required.

P. If the inphase monitor will not allow such a transfer, the control must default to time delay neutral operation. Switches with inphase monitors which do not default to time delay neutral operation are not acceptable.

Q. Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode which bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.

R. Provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from utility or the engine-generator set.

S. Provide manual operating handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure so accessible only by authorized personnel.

T. Provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.

U. Provide LED status lights to give a visual readout of the operating sequence. This shall include utility on, engine warm-up, standby ready, transfer to standby, in-phase monitor, time delay neutral, return to utility, engine cooldown and engine minimum run. A "signal before transfer" lamp shall be supplied to operate from optional circuitry.

V. The transfer switch mechanism and controls are to be mounted in a NEMA 3R enclosure.

PART 3 - ADDITIONAL PROJECT REQUIREMENTS

3.01 FACTORY TESTING

A. Before shipment of the equipment, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:

1. Verify voltage & frequency stability.
2. Verify transient voltage & frequency dip response.
3. Load test the generator for 30 minutes.

B. Applications with NEC 700 emergency loads are generally required to comply with the installation and acceptance requirements of NFPA 110, section 7.13.

C. Load testing to be performed at rated power factor.

3.02 OWNER'S MANUALS

A. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

3.03 INSTALLATION

A. Contractor shall install the complete electrical generating system including all external fuel connections in accordance with requirements of NEC, NFPA, and the manufacturer's recommendations as reviewed by the Engineer.

3.04 SERVICE

A. Supplier of the genset and associated items shall have permanent service facilities within 125 miles of the installation site. These facilities shall comprise a permanent force of certified factory trained service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

3.05 WARRANTY

A. The standby electric generating system components, complete genset and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel. Warranty shall include both generator system and automatic transfer switch.

B. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

3.06 STARTUP AND CHECKOUT

A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:

1. Ensuring the engine starts (both hot and cold) within the specified time.
2. Verification of engine parameters within specification.
3. Verify no load frequency and voltage, adjusting if required.
4. Test all automatic shutdowns of the engine-generator.
5. Perform a load test of the electric plant using a portable load bank sized for 100% of generator capacity. Load test shall include 1 hour at 25% load, 1 hour at 50% load

and 2 hours at 100% load. Records shall be kept at 15 minute intervals, recording minimum engine generator parameters of coolant temperature, oil pressure, generator AC kw, AC amperes, AC voltage, AC frequency.

3.07 TRAINING

A. Perform a load test for 1.5 hours using building load. In addition to the building load test, load the generator at 30% for 30 minutes, 50 % for 30 minutes, and 100% for 60 minutes.

B. Training is to be supplied by the start-up technician for the end-user during commissioning. The training should cover basic generator operation and common generator issues that can be managed by the end-user.

END OF SECTION 26 32 13

SECTION 26 51 00
LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers furnishing and installation of all light fixtures and lamps indicated on the drawings or specified herein.

1.02 STANDARDS AND CODES

A. All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

B. All materials and equipment specified herein shall conform with all applicable NEMA, ANSI, and IEEE standards.

C. All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code.

1.03 SUBMITTALS

A. Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

PART 2 - PRODUCTS

2.01 LIGHT FIXTURES

A. Fixture Schedule: Provide in accordance with the Lighting Fixture Schedule, as shown on the drawings.

B. The fixture catalog numbers listed in the fixture schedule indicate manufacturer, fixture design, quality of design and manufacture, appearance, features, and options required. Lighting fixtures specified will be the basis for comparison in the consideration of fixtures of other manufacturers. Fixtures of lesser quality shall not be considered equivalent.

C. Contractor shall investigate ceiling construction and supply fixtures designed for the application.

D. All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment. The shipment from the fixture manufacturer shall include integrally mounted and/or remote mounted ballasts, where ballasts are required for the proper operation of the fixture lamps.

2.02 HARDWARE

A. The Contractor shall provide any necessary hardware for mounting fixtures. The mounting hardware shall be made of materials suitable for the environment installed. Provide materials made from aluminum, non-metallic, or stainless steel in outdoor, damp,

or corrosive areas. Enclosures for lighting contactors shall be NEMA rated for the environment in which they are installed. In general, devices installed indoors shall be in NEMA 1 enclosures, and devices installed outdoors shall be in NEMA 3R enclosures.

2.03 BALLASTS

A. Ballasts shall be of the high power factor type. All ballasts shall be rated for a degree C operation and be equipped with automatic resetting protective devices in accordance with UL requirements.

B. Ballasts for use in fluorescent fixtures shall be energy efficient GE Maxi-Miser II ballasts or equivalent. Ballasts must be electronic solid state. Magnetic ballasts are not acceptable. Ballasts must have less than 10% total harmonic distortion (THD).

2.04 LAMPS

A. Provide all lamps as specified. Refer to the Lighting Fixture Schedule on the drawing for the ordering information of lamps. Fluorescent lamps shall be energy efficient GE Watt-Miser II or as otherwise indicated. Approved manufacturers are: WESTINGHOUSE, SYLVANIA and GE. Lamps shall be provided for all lighting fixtures.

B. General Use Incandescent Lamps and Incandescent Reflector Lamps are prohibited. Use LED retrofit lamps or LED luminaires in lieu of incandescent or halogen luminaires. LED retrofit lamps shall be:

1. Rated for the voltage of the incandescent lamp/luminaire they are replacing.
2. Dimmable where required as indicated on the plans.
3. Rated for the luminaire in which they are being installed. Verify whether the luminaire is enclosed and whether the LED retrofit lamp is rated for enclosed luminaires and the temperatures that will be encountered.
4. LED lamps/luminaires shall provide delivered footcandles equal to or greater than the footcandles provided by an equivalent incandescent lamp/luminaire.
5. LED retrofit lamps shall have an average rated life of 25,000 hours, minimum.
6. Lamp color temperature shall be nearly equal to the incandescent lamp it is replacing.
7. All lamps shall be new.

2.05 LED LUMINAIRES

A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:

1. Minimum Light Output.
2. Zonal Lumen Requirements.

3. Minimum Luminaire Efficacy.
4. Minimum CRI.
5. L70 Lumen Maintenance.
6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

B. LED Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).

C. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.

D. Luminaire shall be mercury-free, lead-free, and RoHS compliant.

E. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

F. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.

G. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.

H. Lumen output shall not depreciate more than 20% after 10,000 hours of use.

I. Luminaire and driver shall be furnished from a single manufacturer to ensure compatibility.

J. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.

K. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).

L. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.

M. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.

N. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

O. All luminaires shall be provided with knockouts for conduit connections.

P. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).

Q. Provide all of the following data on submittals:

1. Delivered lumens
2. Input watts
3. Efficacy
4. Color rendering index.

R. LED Luminaires used for Emergency Egress Lighting: The failure of one LED shall not affect the operation of the remaining LEDs.

S. Emergency LED Luminaire Compatibility with Inverters: Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.

2.06 LED DRIVERS

A. Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.

B. Minimum Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

C. Driver shall have a rated life of 50,000 hours, minimum.

D. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.

E. Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.

F. Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.

G. Driver shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.

H. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.

I. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.

J. Provide all of the following data on submittals:

1. Input watts
2. Power Factor (pf)
3. Crest Factor (cf) at full input power
4. Total Harmonic Distortion (THD).

2.07 LED DIMMING DRIVERS

A. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.

B. Step-Dimming Drivers: Easily switched from 0% to 50% to 100% output power. Both switch-leg inputs shall control 50% of the luminaire's light output equally.

C. Continuous Dimming Drivers: LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire. Continuous Dimming Drivers shall use 0-10V control.

2.08 SPECIAL ACCESSORIES

A. Provide accessories such as junction boxes, plastic frames, stem, hangers, canopies, couplings, cords, toggle bolts, etc., necessary to mount the fixture in a proper and approved method.

2.09 OCCUPANCY SENSORS

A. Refer to the drawings for the occupancy sensor schedule and device locations. Devices shall be Watt Stopper, or approved equal.

PART 3 - EXECUTION

3.01 FIXTURE MOUNTING

A. The fixture supplier shall provide necessary hanging or mounting devices for all fixtures and shall be responsible for checking the type needed for various ceiling conditions.

B. The Contractor shall see that all lighting fixtures designed to be installed throughout the project shall be of the correct size and design to properly suit the requirements of each area prior to ordering fixtures.

C. Contractor shall install fixtures to avoid access hatches, sky-lights, rails, mechanical equipment, etc.

D. The Contractor shall provide any additional hardware needed for installation of fixtures, including poles, clamps, brackets, screws, bolts, etc.

E. Fixtures and other equipment installed in hazardous areas shall be rated for the environment. Provide fittings and seals per NEC.

F. Pendant mounted lighting fixtures shall be supported by a flexible fixture hanger CROUSE-HINDS Type "AI" and shall have locking couplings, CROUSE-HINDS Type "COUP".

G. Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Coordinate complete fixture installation with the facility construction. Clean and mount all lighting fixtures with new lamps immediately prior to final inspection.

H. Square and rectangular fixtures shall be mounted with sides parallel to building lines and parallel with ceiling lines.

I. Install fixtures as recommended by the manufacturer or as necessary to provide exact horizontal alignment, preventing horizontal or vertical deflection or angular jointing of fixtures installed in continuous rows.

3.02 CONTROL OF OUTDOOR FIXTURES

A. Outdoor light fixtures shall be controlled by means of a photocell and/or time clock, as specified in the written specifications above or in the drawings.

END OF SECTION 26 51 00

DIVISION 27

COMMUNICATIONS

SECTION 27 15 23
COMMUNICATIONS OPTICAL FIBER HORIZONTAL CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Retain or delete this article in all Sections of Project Manual.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The new FLBS Package Plant Wastewater Treatment Facility requires an ethernet connection to interconnect the new infrastructure and lift station pumps/controls to the existing campus network. The existing campus network requires the following items for connection to be made:

1. Underground conduit to be installed from the existing Supply building ground box to the WWTF as shown on the Contract Drawings.

2. Optical single-mode fiber cable pulled from the WWTF to the Elrod Building.

3. Fiber to be terminated in the WWTF in a fiber termination box. The WWTF termination box will mount in an equipment enclosure, which will also house a new network switch with a SFP (small form pluggable fiber connection) supplied by the Owner. Fiber Patch and Cat6 patch cables to be supplied by the Owner.

4. The campus end of the fiber bundle shall terminate in the Elrod Building Server room in an existing fiber termination box. The Contractor shall coordinate with the Owner to complete work in the existing buildings.

5. All fiber shall be tested and certified after installation.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.

2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.

3. Cabling administration Drawings and printouts.

4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

a. Telecommunications rooms plans and elevations.

b. Telecommunications pathways.

c. Telecommunications system access points.

d. Telecommunications grounding system.

e. Telecommunications conductor drop locations.

f. Typical telecommunications details.

g. Mechanical, electrical, and plumbing systems.

C. Fiber optic cable testing plan.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On USB media or compact disk, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

B. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

1. Five years' experience installing fiber optic systems for similar project type in accordance with TIA-568 standards.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end.

2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.09 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications equipment and service suppliers.

PART 2 - PRODUCTS

2.01 CONDUIT

A. 2 Inch Schedule 40 PVC buried conduit runs from the Supply building ground fiber box to the WWTF.

B. All conduit runs must be glued and connected. Conduit shall terminate inside the WWTF enclosure.

C. Conduit location and bury depth shall be as shown on the Contract Documents.

D. Contractor shall coordinate with the Owner for exact location of the existing fiber box and when work in the box is taking place.

2.02 FIBER

A. Fiber shall be pulled from the WWTF to the Elrod Building.

B. The Contractor shall coordinate with the Owner prior to pulling the new fiber through the existing conduit from the Supply fiber box to the Elrod Building.

C. Fiber assembly to include 2 pair (4 strand) Indoor/Outdoor LC/LC single-mode (OS2) Corning fiber cable from Elrod server room to the WWTF. Fiber to be terminated in LC connectors per ANSI/TIA 568-C.3.

D. Any exposed backbone fiber or cable inside the WWTF must meet the ANSI/TIA/EIA-569-B standard for indoor horizontal cable pathways.

2.03 WWTF TERMINATION

A. The termination point shall consist of an EIA/ECIA 310-E 3U-6U rack or wall mounting enclosure (low profile or space appropriate). Open or Closed Type of enclosure is to be determined by the WWTF vendor’s specifications, determined during the submittal phase. Fiber will terminate in a 12-LC port fiber termination box appropriate for the enclosure. The mounting enclosure must have sufficient mounting space to house the fiber termination box; and a 1U Cisco network switch.

B. If the WWTF design exposes the fiber termination point to dust, falling dirt, dripping non-corrosive liquids and/or rust, a NEMA-12 compliant rack enclosure must be used.

C. Rack enclosure must be grounded to existing WWTF supplied ground connection, or a contractor supplied NECA/BICSI 607 compliant grounding connection.

D. Fiber strand colors must align with NECA/FOA 301 5.3 standards. If the strand colors aligning with NECA/FOA 301 5.3 standards cannot be obtained due to market availability, all fiber connections must be labelled at each jack or within 4 inches of the jack.

2.04 NETWORK SWITCH

A. Engineering proposal to include network switch and SMP adapters necessary to terminate fiber in the Elrod Server Room switch and the WWTF network switch. The Network Switch shall be provided by the Owner.

2.05 ELECTRICAL

A. The WWTF shall include the following electrical components for the communications equipment:

1. One dedicated 20A electrical circuit with one single-gang outlet containing two electrical receptacle plugs within 3’ of the network enclosure.

2. A battery backed Universal Power Supply (UPS) for all telecommunications equipment.

2.06 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard. Fiber insertion loss per strand shall not exceed 0.25 dB. Fiber attenuation per strand not to exceed 2 dB.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-C and/or NECA/BICSI 607.

2.07 OPTICAL FIBER CABLE HARDWARE

A. Standards:

1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.

2. Comply with TIA-568-C.3.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, single-fiber cables in 36-inch lengths.

D. Connector Type: Type LC complying with TIA-604-10-B connectors.

E. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.

F. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

G. Faceplate:

1. Two-port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26 "Wiring Devices."
3. Metal Faceplate: Steel (only in unfinished spaces), complying with requirements in Section 26 27 26 "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

2.08 GROUNDING

A. Comply with requirements in Division 26 for grounding conductors and connectors.

B. Comply with TIA-607-C.

2.09 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 INSTALLATION OF OPTICAL FIBER HORIZONTAL CABLES

A. Comply with NECA 1, NECA 301 and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot-long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

3.02 FIRESTOPPING

A. Comply with TIA-569-D, Annex A, "Firestopping."

B. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.03 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-C and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.04 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B.

1. Administration Class: Class 3.

2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 3 level of administration.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, horizontal pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.

4. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting

hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

b. Link End-to-End Attenuation Tests:

i. Horizontal and Multimode Horizontal Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.

ii. Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

G. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

H. End-to-end cabling will be considered defective if it does not pass tests and inspections.

I. Prepare test and inspection reports.

END OF SECTION 27 15 23

DIVISION 31

EARTHWORK

SECTION 31 00 00
EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work is the excavation, trenching and backfilling for the placement of structures, utilities, equipment and appurtenances, handling and storing materials for fill and backfill, bracing, shoring, trench protection, subgrade preparation, final grading, site dressing and cleanup.

B. To the extent possible, reuse existing topsoil and other materials excavated from the site.

1.02 REFERENCES

A. The most recent publication of all the following form a part of this specification:

AASHTO T99	Moisture-Density Relations fo Soils and Soil-Aggregate Mixtures Using 5-lb Rammer and 12" Drop
ASTM D698	Moisture-Density Relations fo Soils and Soil-Aggregate Mixtures Using 5-lb Rammer and 12" Drop
AASHTO T191 ASTM D1556	Density of soil in-place by the sand-cone method
AASHTO T310 ASTM D6938	In-Place density and water content of soil and soil aggregate by Nuclear Method (Shallow Depth)
AASHTO T11 ASTM C117	Materials finer than 0.075 mm (No. 200) sieve in mineral aggregates by washing
AASHTO T27 ASTM C136	Sieve analysis of fine and coarse aggregate
AASHTO T89	Determining the liquid limit of soils
AASHTO T90	Determining the plastic limit and plasticity index of soils
ASTM D4318	Test method for liquid limit, plastic limit and plasticity index of soils

1.03 RELATED DOCUMENTS

A. The following documents and specification sections apply directly to this Section:

1. Division 01 – Payment Procedures & Temporary Facilities and Controls
2. Division 02 – Existing Conditions Site Clearing & Existing Conditions Dewatering;
3. Division 31 – Site Clearing, Geotextiles;

4. Division 32 – Exterior Improvements;
5. Division 33 – Utilities;
6. Division 40 – Process Interconnections

1.04 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade before installing structure.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Select Subgrade: Satisfactory soil imported from off-site for use between membrane liner and imported dike material.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, manholes, lagoon inlets, valve pits, lift stations, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Drainage fabric (if applicable);

2. Separation fabric (if applicable);

3. Stabilization fabric (if applicable).

B. Samples: For the following:

1. 30 lb samples, sealed in airtight containers, of each proposed soil material from on-

site or borrow sources.

2. 1 ft x 1ft samples of drainage fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill;

2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill;

3. Liquid limit, plastic limit and plasticity of soils in accordance with AASHTO T89 and T90, respectively.

1.06 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than 48 hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GM, GC, ML, SC, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, clayey soils, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GP, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 4 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed recycled concrete, and natural or crushed sand.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed recycled concrete, and natural or crushed sand.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed recycled concrete, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 ½ inch sieve and not more than 12 percent passing a #200 sieve. MPW 1.5-inch minus base course.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand having a maximum ¾ inch size and must be free draining and nonplastic.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel having 100% passing the 1 ½ inch sieve and 0 to 10% passing the No. 10 sieve.

J. Rock Fill: MDT Drain Aggregate. 100% passing 6 inch sieve, 0 to 10% passing the ¾ inch sieve and 0 to 5% passing the No. 4 sieve.

K. Select Subgrade: Satisfactory soil materials, with no rocks larger than 2" in any dimension.

2.02 ACCESSORIES

A. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Blasting is not anticipated to be necessary for this project and will not be allowed.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, notify geotechnical engineer and replace with satisfactory soil materials. No additional payment will be made for remedial action due to unsuitable soils.

2. Meet OSHA requirements for excavations (including work performed in pre-existing excavated openings) and excavated material stockpiles. This may require design of temporary slopes and/or shoring by a licensed professional engineer.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Pile Foundations: Stop excavations from 6 inches to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.07 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. No additional payment will be made for remedial action due to unsuitable soils.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.08 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.09 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspecting and testing underground utilities.
3. Removing concrete formwork.
4. Removing trash and debris.
5. Removing temporary shoring and bracing, and sheeting.
6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under footings and foundations, use engineered fill.

3.12 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before

compaction to within 4 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 4 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 8 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cutout soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.

3.15 FIELD QUALITY CONTROL

A. Testing: The Engineer will perform field quality-control testing. The Contractor may also engage the services of a qualified testing firm to perform field quality-control testing to verify the Engineer's testing results, at no additional cost to the OWNER.

B. Allow Engineer to inspect and test subgrades and each fill or backfill layer. Proceed with

subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Engineer and Contractor's independent firm (if applicable) will test compaction of soils in place according to ASTM D 2922. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 square feet or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

3. Utility Structures: At each compacted backfill layer, at least one test for every 100 square feet or less, but no fewer than one test per structure.

E. When Engineer's testing reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained. Contractor shall be responsible for the cost of repeat testing conducted by the Engineer.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 00 00

SECTION 31 05 13
SOILS FOR EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Subsoil materials.
2. Topsoil materials.

B. Related Sections include:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 SUBMITTALS FOR REVIEW

A. See Section 01 33 00 - Submittals: Procedures for submittals.

B. Samples: In accordance with Section 01 40 00.

1.03 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Control: Field Samples.

B. Material Source: Provide materials from the same source throughout the Work. Change of source requires Engineer approval.

PART 2 - PRODUCTS

2.01 SUBSOIL MATERIALS

A. Subsoil: Uncontaminated excavated onsite material or imported borrow material. Graded free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

1. Type A: See MPWSS, latest edition. Existing (Native) soil shall be considered a Type A.
2. Type B: See MPWSS, latest edition.
3. Type C: Non-used; All frozen material, vegetation, trash, rocks, and concrete and bituminous chunks having a dimension exceeding 3 inches.

2.02 TOPSOIL MATERIALS

A. Topsoil: Uncontaminated excavated onsite material or imported borrow material; Graded free of roots, rocks larger than ¾ inches, subsoil, debris, large weeds, and foreign matter.

1. Imported or Re-used; Friable loam. Acidity range (pH) of 5.5 to 7.5 containing a minimum of 4 percent and a maximum of 25 percent organic matter. Conforming to ASTM D2487 Group Symbol OL and OH.

2.03 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698, ASTM D2922, and ASTM D3017.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D2487.

D. Provide materials of each type from same source throughout the Work.

E. Contractor to obtain and pay for services of soil classification technician from an independent geotechnical laboratory to monitor soils installed.

END OF SECTION 31 05 13

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work includes the identification, preparation, removal, stockpiling, salvage and disposal of existing surface materials at the project site which are impacted by or interfere with construction of the improvements.

1.02 RELATED DOCUMENTS

A. The following documents and specification sections apply directly to this Section:

1. Drawings and Special Provisions of the Contract;
2. General and Supplementary Conditions;
3. Division 01 - General Requirements;
4. Division 02 - Existing Conditions;
5. Division 31 - Earthwork;
6. Division 33 - Utilities.

1.03 SUMMARY

A. This Section includes, but not limited to, the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation as necessary.
3. Clearing and grubbing.
4. Topsoil stripping and stockpiling;
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting and removing site utilities.

1.04 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.05 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner’s property, cleared materials shall become Contractor’s property and shall be removed from the site.

1.06 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 00 00 – Earthwork; and 31 05 13 – Soils for Earthwork.

1. Obtain approved borrow soils materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TREE PROTECTION

A. Do not store construction materials, debris, or excavated material within drip line of remaining trees.

B. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

C. Do not excavate within drip line of trees, unless otherwise indicated.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.

1. Replace trees that cannot be repaired and restored to full-growth status, as determined by a qualified arborist.

3.03 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Owner will arrange to shut off any publicly-owned utilities indicated to be removed.

2. Contractor shall arrange to shut off any privately-owned utilities with utility companies.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

3.04 CLEARING AND GRUBBING

1. Perform Clearing and Grubbing in accordance with 31 11 00.

3.05 TOPSOIL STRIPPING

1. Topsoil stripping and stockpiling shall be conducted in accordance with Section 31 14 13.

3.06 SITE GRADING

A. Rough-grade the site to provide positive drainage away from all construction elements and away from the site in such a manner that no damage to adjacent property will result from runoff.

1. Project site shall be graded sufficiently smooth to provide access to all elements of construction.

3.07 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.08 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property unless Contractor has made arrangements for onsite disposal.

END OF SECTION 31 10 00

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Protection of features not designated for removal.
2. Site removals.
3. Disposal of waste materials.

B. Related Sections include:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirement Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 REGULATORY REQUIREMENTS

A. Conform to applicable codes and regulations for proper disposal of debris.

B. Conform to applicable codes for worker safety.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Construction Fencing: Construction fencing shall be orange plastic mesh, heavy duty, snow fencing fastened to metal or wood posts.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that existing plant life designated to remain is tagged or identified.

B. Beginning work of this Section means acceptance of existing conditions.

C. Identify and furnish an area for storing or placing removed material prior to the commencement of Work in this Section.

3.02 PROTECTION

A. Locate, identify, and protect utilities that remain from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect bench marks, survey control points, and existing structures from damage.

D. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades and from flooding site and surrounding area.

E. Contractor shall repair or replace, to original condition or better, existing structures and improvements, flora, and landscaping damaged or injured during construction operations. Contractor shall understand the sensitive nature of working on or near developed property and shall endeavor to limit injury or damage both inside the limits of construction and outside the limits of construction.

F. Protect existing trees and other vegetation indicated to remain from unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees, by stockpiling construction materials or excavated materials within the drip line, excess foot of vehicular traffic, or parking of vehicles within drip line.

G. Protect wetlands, rivers, streams, and other waters of the state from all construction activities and contamination by erosion and runoff.

H. Protect areas that have been finish graded from subsequent construction operations, traffic, and erosion. Remove, provide new, and compact as required, material contaminated by erosion and runoff

3.03 WORK BY OTHERS

A. Sod in areas to be disturbed will be removed by others prior to commencement of earthwork activities.

3.04 CLEARING

A. Clear areas required for access to site and execution of Work.

3.05 GRUBBING

A. Shall conform to Montana Department of Transportation (MDT) Standard Specifications for Road and Bridge Construction (2014 edition). Section 201.03.1 shall be followed except as specified below and absolutely no burning will be allowed.

1. Grubbing operations may be completed by removal of stump section or by grinding
2. Remove stumps, logs, roots, and other organic matter located within proposed pavements and structures to the depth indicated:
    a. Gravel or paved surface: 48” below surface grade.
    b. Grass areas: 12” below surface grade
    c. Other structures or utilities: 36” below existing ground or finish grade, whichever is lower.

B. Depressions resulting from grubbing operations shall be backfilled in accordance with other sections in Division 31.

3.06 DISPOSAL OF WASTE MATERIALS

A. Remove all clearing and grubbing debris from the site in accordance with the Contract Documents and all permits and regulations. Burning shall not be allowed on Owner’s property.

END OF SECTION 31 11 00

SECTION 31 11 10
REMOVAL OF EXISTING PAVEMENT, CONCRETE CURB, SIDEWALK, DRIVEWAY, AND/OR STRUCTURES
(Reference MPWSS Section 02112)

All applicable portions of MPW Standard Specification Section 02112 shall apply with the following additions, deletions, and/or modifications.

PART 3 - EXECUTION

Delete the last sentence of 3.1.C and add the following:

Edges on all concrete and asphalt shall be straight lines and vertical cuts made with a saw. Concrete shall be cut with a saw to a depth of 4 inches minimum. Section deeper than 4 inches may be broken after cutting. Resulting face shall not be flatter than a 1:1 from vertical. Construction methods will not disturb the remaining concrete slabs.

All slabs to remain shall be replaced, if disturbed, at no cost to the owner.

Exercise care in removal of existing tree roots that conflict with the work. Tree roots shall be removed by saw-cutting the roots to a neat line at the extent of the excavation. Remove only the minimum amount of roots necessary in order to complete the work.

PART 4 - MEASUREMENT AND PAYMENT

DELETE: Entire Section and refer to Section 01 29 00

END OF SECTION 31 11 10

SECTION 31 14 13
SOIL STRIPPING AND STOCKPILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Protection of features not designated for removal.
2. Topsoil Removal.
3. Stockpiling of Materials.
4. Stockpile Cleanup.
5. Estimated Excess Material Volumes.

B. Related Sections include:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirement Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 DESCRIPTION

A. Limits of construction are shown on the Drawings. Excavation shall not be allowed outside of the limits of construction where shown on the Drawings.

B. Materials may be temporarily stockpiled on the site within the limits of construction or where shown on the Drawings.

C. Protect benchmarks and existing structures that are to remain from damage or displacement.

1.03 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

1.04 DEFINITIONS

A. Soil Testing Laboratory: Refers to a professional soils engineering firm with soil sampling and testing services that is independent from the Contractor.

B. Structures: Existing and new construction, including slabs, buildings, footings, tanks, and other structural elements.

1.05 SITE CONDITIONS

A. Soil borings were taken for this project by Pioneer Technical Services, Inc. The Geotechnical Investigation Report and associated Addenda are included in the Appendix of this Project Manual.

B. Data indicated on the subsurface conditions are not intended as representations,

warranties of accuracy, or continuity between soil borings. It shall be expressly understood that Owner and Engineer shall not be responsible for interpretations or conclusions drawn from these reports by the Contractor. The information is made available for the convenience of the Contractor and is in no way, shape, or form considered a part of this Contract.

C. Contractor shall determine to Contractor's own satisfaction the nature and location of subsurface obstacles and the nature of soil and water conditions which will be encountered during the work.

D. Contractor may perform additional test borings or other exploratory operations at Contractor's own expense. Contractor shall make arrangements for any additional soils investigation with Owner.

E. No claim for additional payment will be accepted due to the nature of subsurface conditions in which the work is to be performed.

F. Do not commence construction of structure foundation until soil test results are confirmed.

1.06 ADDITIONAL PAYMENT

A. All excavation, removal, and disposal of earth, peat, muck, and other materials; erosion control; sheeting, shoring, and bracing; fill and backfill, placement, compaction, grading, source quality testing; stockpiling; and all other work under this Section shall be considered incidental to the Project and no claim for additional compensation of extra work will be accepted.

B. No claim for additional payment will be accepted for excavation and fill for all or improvements required for removal of unsuitable material up to three (3) feet below bottom of proposed foundation or one (1) foot below bottom of noted geosynthetically reinforced structural fill or one (1) foot below minimum excavation limit or as noted on the Drawings, whichever results in the greater excavation and fill.

C. Excavation and fill required for removal of unsuitable material deeper than the above limits will be paid for on a time and materials basis if conditions found in the Geotechnical Report are found to differ from actual conditions experienced on site. No additional payment will be made for conditions reflected in the Geotechnical Report.

D. No claim for additional payment will be accepted for repairs made to subgrade due to weather related items.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall verify which native materials are suitable for reuse at the site. Provide testing data as required and keep materials separated.

B. Notify Engineer of any unsuitable materials.

3.02 PROTECTION

A. Protect all existing structures, trees, plantings, turf, and other facilities which are not scheduled for removal.

3.03 TOPSOIL REMOVAL

A. All topsoil shall be stripped to full depth and stockpiled separately to be placed on top of finished grading and all disturbed areas not covered by structures or pavement. Remove all heavy growths of grass prior to stripping topsoil.

B. Separate all debris, large roots, and rocks greater than one (1) inch from the topsoil and remove from the site in accordance with all applicable Federal, State, and Local regulations to Contractor furnished site.

C. Where trees are to be left standing, stop topsoil stripping a sufficient distance (at least the drip line) from a tree to prevent damage to main root system.

3.04 STOCKPILING OF MATERIALS

A. Contractor may temporarily stockpile acceptable materials including topsoil, excess excavated, and delivered materials within the limits of construction where shown on the Drawings. Contractor shall obtain approval from Engineer before stockpiling excess materials.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Apply appropriate erosion control measures to stockpile areas.

F. Avoid stockpiling in location of future levee or berm around the site.

G. Contractor shall remove all excess stockpiles from the site prior to substantial completion of the project.

3.05 STOCKPILE CLEANUP

A. Remove stockpile; leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.

B. Restore stockpile area in accordance with Section 32 90 00.

C. Temporary Stockpile Area:

1. Contractor shall place material from excavations onsite in the area designated on the plans.

END OF SECTION 31 14 13

SECTION 31 22 00
GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general requirements and procedures for site grading including, but not limited to, the following:

1. Rough Grading
2. Finish Grading
3. Topsoil Placement

B. Related Sections include:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirement Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 DESCRIPTION

A. Contractor shall grade the site as shown on the Drawings. Contours and spot elevations indicate finished surface grades.

B. Construct uniform slopes between contours and spot elevations.

C. Limits of construction are shown on the Drawings as indicated by the fencing boundary. Excavation, placement of fill, or general grading shall not be allowed outside of the limits of construction where shown on the Drawings.

D. Materials may be temporarily stockpiled on the site within the limits of construction or where shown on the Drawings.

E. Topsoil removal and rough grading of the site shall be completed prior to structure erection.

F. Perform finish grading and topsoil placement after structure erection.

G. Protect benchmarks and existing structures that are to remain from damage or displacement.

H. All earthwork shall be performed in a manner and sequence that will provide drainage and proper erosion control at all times.

1.03 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

B. Contractor shall utilize a licensed surveyor to provide grading layout, elevations, staking and all necessary offsets.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Type S4 as specified in Section 31 05 13.

B. Subsoil Fill: Type S1 or S2 as specified in Section 31 05 13.

C. Engineered Fill: Type A4 as specified in Section 32 05 16.

D. Aggregate Base and Surface Course: Type A3 and A2 respectively as specified in Section 32 05 16 and shown on drawings.

E. Provide source testing data in accordance with Section 01 40 00.

2.02 SOURCE QUALITY CONTROL

A. Conduct the following tests on each material proposed for use prior to start of soils work. Refer to Section 01 40 00 for source test requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify structure and trench backfilling have been inspected.

B. Verify subgrade base has been contoured and compacted.

3.02 PROTECTION

A. Contractor shall conduct all grading operations within the limits of construction where shown on the Drawings, and within the designated grading limits as shown from contours and spot elevations.

B. Protect all existing structures, trees, plantings, turf, and other facilities which are not scheduled for removal

C. Provide proper erosion and sediment control for all grading operation.

D. Repair disturbed areas and compact to required density prior to further work.

E. Remove material contaminated by erosion and runoff, provide new material and compact.

3.03 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, and stones in excess of 2 inches in size. Remove subsoil contaminated with petroleum products.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.04 ROUGH GRADING

A. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finish surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and

existing grades.

B. Grade surface of fill under structures and slabs to required density, free of voids, and to required elevations.

C. Rough grade areas adjacent to structure lines to drain away from structures and to prevent ponding or increase in soil lateral pressure on the structure.

3.05 FINISH GRADING

A. Contractor shall provide the degree of finish grading that will be normally obtainable through the use of suitable equipment operated under favorable conditions and by an experienced operator. Deviations from the required tolerance shall be corrected by the Contractor at no additional cost to the Owner.

3.06 TOPSOIL PLACEMENT

A. Place topsoil in areas where seeding and restoration is required to a nominal depth of 6 inches. Place topsoil during dry weather.

B. Use imported topsoil as a supplement to stockpiled topsoil only when a 6 inch depth is unable to be maintained.

C. Drag topsoiled areas to remove wheel tracks and provide a uniform texture and appearance.

D. Place fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade. Finish grades shall allow for proper drainage without ponding.

E. Remove roots, weeds, rocks, and foreign material while spreading.

F. Manually spread topsoil close to plant life and buildings to prevent damage.

G. Lightly compact placed topsoil.

H. Remove surplus subsoil and topsoil from site. Contractor shall pay for loading, hauling, and spreading of all excess topsoil materials removed from the site or placed and spread on-site by direction of Owner or Engineer.

I. Contractor shall pay for additional topsoil that is required at the site, including providing transporting and placing topsoil.

J. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.07 TOLERANCES

A. Surface of Topsoil: Plus or minus 1 inch.

END OF SECTION 31 22 00

SECTION 31 22 10
GRAVEL ROADWAY AND SHOULDERS

PART 1 - GENERAL

The work covered by this section of the specifications shall consist of furnishing, placing, watering, shaping and compacting gravel to provide a firm and stable roadway and parking lots or driveway. Existing gravel roadways, driveways and parking lots disturbed during construction shall be replaced with gravel as noted on the drawings. The typical section for gravel shall be as shown on Sheet CD-7 of the project drawings. Minor surface repairs shall be made with crushed gravel surface course only at no cost to the Owner.

END OF SECTION 31 22 10

SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Scarifying, compacting and shaping the earth subgrade.
2. Perform subgrade preparation on all areas to receive concrete pavement, bituminous pavement, aggregate base course, and/or aggregate surface course.

B. Related Sections:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections

PART 2 - PRODUCTS

2.01 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to approval of the Engineer.

B. Suitable Soil Materials: On-Site excavated material or imported material meeting subsoil classification S1, S2, or S3 as defined in Section 31 05 13, free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

PART 3 - EXECUTION

3.01 GENERAL

A. The contractor shall follow the recommendations as provided in the December 2022 Flathead Bio Station Geotechnical Report by Pioneer Technical Services, Inc. The Geotechnical Investigation Report and associated Addenda are included in the Appendix of this Project Manual.

B. Subgrade Preparation shall consist of producing a firm and stable subgrade prior to placement of the surface or base course.

3.02 SUBGRADE PREPARATION

A. The Contractor shall compact and shape the subgrade for its full width as may be necessary to produce, at the time the base course is placed, the required density in the upper 12-inches of the base and the required grade and cross-section.

B. If areas are encountered that cannot be compacted, sub-excavate unstable materials and replace with materials that can be compacted.

C. Contractor shall be responsible for drying the subgrade soil or applying water as may be necessary to obtain the required density. Contractor shall also be responsible for grading the Work area and providing drainage so that accumulating water will drain away from the subgrade.

D. The finished subgrade surface shall be smooth and uniform and shall not rut, shove, flex, or displace when any construction equipment is placed on it.

E. The required grade and cross-section for subgrades shall consist of a smooth subgrade surface that conforms to the prescribed elevations for the particular subgrade being prepared, prior to constructing an additional course thereon. The required grade and cross-section for rough graded surfaces shall consist of a smooth graded surface that conforms to the prescribed elevations for that particular rough grade being prepared. The prescribed elevation for any point on the subgrade or rough graded surfaces shall be as determined from the grades staked by the Engineer.

F. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations, vehicular traffic, or weather conditions.

G. Subgrade preparation shall apply to all mat foundations, pipe trenches, concrete slabs, paved and graveled areas, including roads, driveways, parking areas, and sidewalks.

H. Testing requirements for subgrade preparation shall be as follows:

1. Shall conform to requirements of Section 01 40 00.

3.03 SPECIAL REQUIREMENTS

A. Only hand-operated compaction equipment should be used within 5 feet of walls.

B. Final subgrade elevation improvements for mat foundations should be smoothed using a vibratory plate, care shall be taken to prevent pumping of subgrade.

3.04 TOLERANCES

A. Finish subgrade or rough graded surfaces shall not deviate by more than 1 inch from the required section and grade.

END OF SECTION 31 23 13

SECTION 31 23 16
EXCAVATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Requirements for Excavation.
2. Subgrade Preparation.
3. Common Excavation.
4. Structural Excavation.
5. Estimated Excavation Quantities.
6. Disposal.

B. Related Sections:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. Montana Public Works Standard Specifications (MPWSS), latest edition.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:

1. Test Results: Prior to start of work, submit written reports for each material sampled and tested. Include project identification, date of report, name of contractor, name of testing laboratory, source of material, manufacturer and brand name for manufactured products, specification requirements for each material, and corresponding test results.
    a. Tests must have been taken no more than 180 calendar days before Notice to Proceed.
2. Product Data: Information on manufactured products indicating compliance with requirements of this Section.

1.04 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Structures: Existing and new construction, including slabs, buildings, tanks, and structural elements and systems.

C. Acceptable Materials: Material that will provide for the indicated soil bearing capacity, soil densities, material requirements and that, in the opinion of soil testing laboratory, will not be subject to future decomposition, settlement, subsidence, expansion and are otherwise of the required soil type.

D. Unsuitable Materials: Material that will not provide for the indicated soil bearing capacity and soil densities and that in the opinion of the soil testing laboratory will be subject to future decomposition, settlement, subsidence, expansion, and are otherwise not of the required soil type.

E. Soil Testing Laboratory: Refers to professional soils engineering firm with soil sampling and testing services and that is independent from the Contractor. The soil testing laboratory's engineer shall be licensed in the State of Montana.

F. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, topsoil removal, excavation to grade, and scarification and compaction of subgrade.

1.05 SITE CONDITIONS

A. Soils data were collected for this project by Pioneer Technical Services and are reflected in the December 2022 Geotechnical Investigation Report – included in the Appendix of these project documents.

B. Data indicated on the subsurface conditions are not intended as representations, warranties of accuracy, or continuity between soil borings. It shall be expressly understood that Owner and Engineer shall not be responsible for interpretations or conclusions drawn from these reports by the Contractor. The information is made available for the convenience of the Contractor and is in no way, shape, or form considered a part of this Contract.

C. Contractor shall determine to Contractor's own satisfaction the nature and location of subsurface obstacles and the nature of soil and water conditions which will be encountered during the work.

D. Contractor may perform additional test borings or other exploratory operations at Contractor's own expense. Contractor shall make arrangements for any additional soils investigation with Owner.

E. No claim for additional payment will be accepted due to the nature of subsurface conditions in which the work is to be performed.

F. Do not commence construction of structure foundation until soil test results are confirmed.

G. See Geotechnical Excavation Report by Pioneer Technical Services, Inc. for recommended soil bearing capacities for footings and structures.

1.06 CONVENTIONAL QUALITY ASSURANCE

A. Source Quality Control Testing: Retain the services of an independent soil testing laboratory for Source Quality Control sampling and testing.

B. Materials and installed work may require testing and retesting, as required by Engineer, at any time during progress of work.

C. Allow free access of testing laboratory to material stockpiles and facilities at all times.

D. Tests including retesting of rejected materials and installed work shall be at Contractor's own expense unless otherwise indicated.

E. See Section 01 40 00 for additional requirements.

1.07 SEQUENCING AND SCHEDULING

A. Additional excess material shall be stockpiled in accordance with Section 31 14 13.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Stockpile delivered materials and excavated materials at locations approved by Owner until required for backfill or fill. Place, grade, and shape stockpiles for drainage.

B. Store materials in manner that will not impose additional loading and soil pressure on excavation limits and structures.

1.09 PAYMENT

A. All earth rock, peat, muck and all other excavation, removal and disposal required; erosion control, sheeting, shoring and bracing; fill and backfill; placement compaction, grading, source quality control testing, and all other work required under this Section shall be considered incidental to the Project and no claim for compensation or extra work will be accepted.

B. No claim for additional payment will be accepted for excavation and fill for all structures required for removal of unsuitable material of up to three (3) feet below bottom of foundation or one (1) feet below noted structural fill or backfill or one foot below minimum excavation limit as noted on Drawings, whichever results in the greater excavation and fill.

C. Excavation and fill required for removal of unsuitable material deeper than the above limits will be paid for on a time and materials basis if conditions found in the Geotechnical Report are found to differ from actual conditions experienced on site. No additional payment will be made for conditions reflected in the Geotechnical Report.

D. No claim for additional payment will be accepted for repairs made to subgrade due to weather related problems.

1.10 FIELD MEASUREMENTS

A. Survey benchmarks, control points, and intended elevations for the Work are as shown on the Drawings or will be provided by the Engineer.

1.11 COORDINATION

A. Coordinate work under provisions of Section 01 31 13.

B. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

C. Contractor shall excavate for structures, pipe, and utilities at grades shown on the Drawings. Careful consideration shall be given to whether elevations shown are invert elevations or centerline elevations, Contractor shall make appropriate adjustment depending on elevation shown.

PART 2 - PRODUCTS

2.01 EXCAVATION MATERIALS

A. See Sections 31 00 00 and 31 05 13 for materials specifications.

2.02 SOURCE QUALITY CONTROL

A. See Section 31 23 23 and Section 01 45 00 for material quality testing requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine project site and conditions under which work of this Section is to be performed.

B. Contractor shall verify which native materials are suitable for reuse at the site. Provide testing data as required and keep materials separated.

C. Notify Engineer of any unsuitable materials.

D. Do not over excavate without authorization from Engineer.

3.02 PREPARATION

A. An OSHA approved competent person shall review the above mentioned soil classification in the field. Excavations shall comply with the requirements of OSHA 29 CFR, Part 2926, Subpart P, “Excavations and Trenches.” Excavation safety is the responsibility of the Contractor. All excavations greater than 20 feet in depth shall be designed by a registered Professional Engineer.

B. Protection

1. Locate existing utilities in areas of work. Protect utilities that are to remain.

2. Protect structures from damage and from damage caused by groundwater, surface water, flood or floatation forces, lateral movement, settlement, undermining, washout, and other undesirable conditions created by the work.

    a. Maintain drainage when drainage ways are obstructed by earthwork and related operations.

3. Protect areas beyond construction zone with erosion control system.

4. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when allowed by utility owner and then only after acceptable temporary utility services have been provided.

    a. Provide temporary services, complying with Federal, State and local laws and regulations, and as acceptable to Owner, during any interruptions.

5. Maintain full access to structure exits and entrances, fire hydrants, street crossings, sidewalks, and other points as designated by Owner to prevent significant interruption of accessibility.
6. Do not bring explosives on site or use in work.
7. Maintain excavations and stockpiles to prevent caving, heaving, slides, and increased soil pressures on adjacent and underlying structures.
8. Maintain existing site drainage ways or provide new paths of drainage for site as required to perform earthwork.

C. Dry subgrade: Add water, then mix to make moisture content uniform throughout.

D. Wet subgrade: Aerate material by blading, discing, harrowing, or other methods to hasten drying process.

E. Excavation support: Install and maintain, as specified in Section 31 41 00, Shoring, as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

3.03 PROTECTION

A. Locate existing utilities in areas of work. Protect utilities that are to remain.

B. Protect structures from damage and from damage caused by groundwater, surface water, flood or floatation forces, lateral movement, settlement, undermining, washout, and other undesirable conditions created by the work.

1. Maintain drainage when drainage ways are obstructed by earthwork and related operations.

C. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when allowed by utility owner and then only after acceptable temporary utility services have been provided.

1. Provide temporary services, complying with Federal, State and local laws and regulations, and as acceptable to Owner, during any interruptions.

D. Protect areas that have been finish graded from subsequent construction operations, traffic, and erosion.

1. Install erosion control protection along perimeter of unfinished areas.

E. Maintain full access to structure exits and entrances, fire hydrants, street crossings, sidewalks, and other points designated by Owner to prevent significant interruption of accessibility.

F. Do not bring explosives on site or use in work.

G. Maintain excavations and stockpiles to prevent caving, heaving, slides, and increased soil pressures on adjacent and underlying structures.

H. Repair disturbed areas and compact to required density prior to further work.

I. Remove material contaminated by erosion and runoff, provide new material and compact.

3.04 COMMON EXCAVATION

A. Excavate designated areas to the proposed subgrade elevations indicated on the Drawings.

B. Contractor shall advise Engineer immediately if any unsuitable materials are encountered during excavation. Unsuitable materials shall be reasonably separated form unsuitable materials and shall be considered surplus material at no additional cost to the Owner.

C. If Contractor encounters excess excavation materials which meet the requirements of common fill as specified herein, Contractor may use those materials as common fill. Contractor shall verify with soils testing laboratory suitability of the use of on-site material.

D. Trench excavating shall be done in accordance with Section 31 23 33.

3.05 STRUCTURAL EXCAVATION

A. Remove unsuitable materials in accordance to the depth recommended by soils testing laboratory beneath structures to obtain the design bearing capacity.

1. Do not bear any structure partially on bedrock and partially on more compressible soils. Remove bedrock materials and replace them with clean compacted sand or gravel in accordance to the Geotechnical Report.

2. Dewater as warranted in accordance with Contractor's approved dewatering plan, prior to initiating construction within any excavation.

3. Provide an opportunity for the Engineer to properly inspect the bottom of any excavation and remove any soft spots or unsatisfactory soils that are observed.

4. When bottoms of excavations are approved by soils testing laboratory, but are slightly unstable only in relation to Contractor operations or convenience, Contractor may provide a compacted gravel course utilizing materials acceptable to the soil testing laboratory. Such work shall be considered for the Contractor's convenience and at Contractor's own expense.

B. Treatment Facility

1. Excavate and remove surficial topsoil beneath the gravel pad footprint to design elevation.

2. Provide an opportunity for the engineer to inspect the bottom of the excavation. Excavate soft spots or unsatisfactory materials that are observed.

3. Moisture condition subgrade soils to plus or minus 2% of optimum moisture content. Compact the subgrade soils to a standard relative compaction (ASTM D698) of at least 98%

a. Compacted excavation surface should be proof-rolled with heavy equipment. Engineer should be allowed to observe proof-rolling to approve compacted surface.

4. Place and compact structural fill to design grade. Place gravel fill in 8-inch maximum loose lifts and compact to a standard relative compaction of at least 98%. Structural fill should meet the gradation requirements meeting MPW 1.5-inch Minus Base Course.
5. Ensure there is positive drainage away from the open excavation to keep all surface water from draining into the excavation. This recommendation also applies to final grading, where positive drainage must be in place around the entire gravel pad perimeter.

C. Buried Tanks – Bottom of the tank is positioned in native granular soils

1. Excavate to design grade. Dewater if warranted.
2. Provide an opportunity for the engineer to inspect the bottom of the excavation. Excavate soft spots or unsatisfactory materials that are observed.
3. Moisture condition subgrade soils to plus or minus 2% of optimum moisture content. Compact the subgrade soils to a standard relative compaction (ASTM D698) of at least 95%.
4. Set the tank

D. Buried Tanks – Bottom of the tank is in the very soft to soft clay

1. Dewater the site as required for construction.
2. Excavate and remove soil to 18 inches below the bottom of the tank. Horizontally, the excavation should be extended 2 feet beyond the perimeter.
3. Compact subgrade by one of the following methods:
    a. If soil and moisture conditions allow, moisture condition the subgrade soil to plus or minus 2% of optimum moisture content and compact subgrade to a standard relative compaction (ASTM D698) of at least 90%.
    b. If subgrade soil is saturated and prone to pumping, compact subgrade with a minimum of four passes of a sheep's foot roller. Do not use vibratory compaction. Discontinue compaction if the process is drawing water upward or causing pumping. Density testing is not required.
4. Place Propex Geotex 801 nonwoven geotextile (or approved equal) across the compacted surface. Place Tensar BX1200 Biaxial Geogrid (or approved equal) on top of the woven geotextile. The geosynthetics should be installed in accordance with manufacturer's recommendations.
5. Place 12 inches of rockfill over the geosynthetics. Compact with a minimum four passes using compaction or tracked equipment. With engineer approval, bucket compaction is acceptable alternative to any location equipment cannot safely access. Rockfill should meet the gradation requirements of MDT Drain Aggregate.
6. Place Propex Geotex 801 nonwoven geotextile across the compacted rockfill surface. Install in accordance with manufacturer's recommendations.

7. Place structural fill to design elevation. Place in 8-inch (maximum) loose lifts and compact each lift to a standard relative compaction of at least 95%. A ¾-inch minus crushed coarse concrete aggregate is an acceptable alternative to the structural fill.
8. Set the tank.

E. Slope sides of excavations as required to provide stability and to comply with Federal, State and local laws and regulations. Shore and brace excavation when required by project conditions.
   1. Utilize cofferdams, steel sheet piling, shoring, underpinning, and other systems required to prevent damage to existing structures, settlement, slope stability problems, and undermining.
   2. Remove construction related protection systems after their need is complete, in a manner that will not loosen or damage soils, create slope stability problems, and otherwise damage existing and new structures.
      a. Leave construction-related protection systems in place when their removal would create potential for damage to the soil conditions or to structures.

F. Excavate to required elevations and dimensions within a tolerance of plus or minus 1 inch, and extending a sufficient distance as required to provide for the work, completion of the structures, observation, and testing.
   1. When excavating for footings and foundations, do not disturb soil materials at and below excavation limits. Excavate by hand when necessary to prevent damage to soil materials that will remain.
   2. Trim bottoms to required lines and grades to leave solid dense base of required bearing capacity.
   3. Final removal limits shall be approved by soil testing laboratory prior to concrete placement.

G. Removal of materials beyond required subgrade elevations or dimensions without specific approval of soils testing laboratory as well as backfilling, compaction and remedial work recommended by soils testing laboratory at the over-excavated area shall be at Contractor's own expense.
   1. Under structures and their components fill unauthorized excavation utilizing one of the following systems:
      a. Extend indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation.
      b. Install lean concrete fill to bring elevations to required position.
      c. Fill and compact unauthorized excavations with soil materials and to required density.
   2. Elsewhere, backfill and compact unauthorized excavations as indicated for authorized excavations of same classification

H. Protect excavation bottoms from freezing. Remove frozen materials and provide unfrozen compacted materials prior to placement of materials on them.

I. Excavations of structures shall be widened a minimum of one foot horizontally beyond the outer edges of the building perimeter footings for each foot the excavations extend below bottom-of-footing elevations.

J. It is anticipated the excavation bottom for each structure will consist of sand soils, lean clay or a combination of both. These soils shall be maintained within the prescribed moisture content range until successive layers are placed over them. Thus, if the placement of backfill and fill is slowed or delayed during dry or wet weather, re-conditioning of the placed backfill, fill and natural soils may be necessary.

K. Prior to the placement of engineered fill or construction of structures, any loosened granular materials shall be surface compacted using a vibratory plate compactor. In areas where groundwater is within 3 feet of the subgrade this requirement may be waived in the field by the Engineer if it is found the compaction is pumping up water or creating a temporary “quick” condition and the soils are otherwise suitable for support of the foundations. Areas that yield or pump during surface compaction may require additional subcutting.

3.06 DISPOSAL

A. Excess soil, if any exists, shall be stockpiled on the site. Contractor shall remove unsuitable material such as muck, organic matter, trash, and refuse from the site and dispose of said material according to applicable Federal, State, and local regulations. No additional payment will be provided for off-site disposal.

END OF SECTION 31 23 16

SECTION 31 23 21
FILL AND BACKFILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general requirements and procedures for site grading including, but not limited to, the following:

1. Filling, Backfilling, and Compacting.

B. Related Sections include, but are not limited to:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 REFERENCES

A. Montana Public Works Standard Specifications (MPWSS) specifications are referenced for material requirements and specific construction requirements only.

1.03 DESCRIPTION

A. Limits of construction are shown on the Drawings. Placement of fill shall not be allowed outside the fence boundary where shown on the Drawings unless location is authorized by the Owner.

B. Materials may be temporarily stockpiled on the site within the limits of construction, or where shown on the Drawings.

C. Excess materials shall be stockpiled on site at locations authorized by Owner.

D. Protect benchmarks and existing structures that are to remain from damage or displacement.

1.04 DEFINITIONS

A. Suitable Material: Material that will provide the indicated required soil bearing capacity, soil densities, material requirements or, in the opinion of the soils testing laboratory, will not be subject to future decomposition, subsidence, settlement, or expansion.

B. Structures: Existing and new construction, including slabs, buildings, footings, tanks, and other structural elements.

C. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D1557.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by the Engineer.

D. Optimum Moisture Content:

1. Determined in accordance with ASTM standard specified to determine maximum dry density for relative compaction.

2. Determine field moisture content on basis of fraction passing ¾-inch sieve.

E. Relative Density: Calculated in accordance with ASTM D4254 based on maximum index density determined in accordance with ASTM D4253 and minimum index density determined in accordance with ASTM D4254.

F. Complete Course: A course or layer that is ready for next layer or next phase of Work.

G. Lift: Loose (uncompacted) layer of material.

H. Well-Graded:

1. A mixture of particle sizes with not specific concentration or lack thereof of one or more sizes.

2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.

3. Use to define material type that, when compacted, produces a strong and relative incompressible soil mass free of detrimental voids.

I. Influence Area: Are within planes sloped downward and outward at 60-degree angle from horizontal measured from:

1. 1 foot outside outermost edge at base of foundations or slabs.

2. 1 foot outside outermost edge at surface of roadways or shoulder.

3. 0.5 foot outside exterior of spring line of pipes.

J. Borrow material: Material from required excavations or from designated borrow areas on or near Site.

K. Select Backfill Material: Materials available on-site that Engineer determines suitable for specific use.

L. Imported Material: Materials obtained from sources offsite, suitable for specified use.

1.05 SITE CONDITIONS

A. Soil borings were taken for this project by Pioneer Technical Services, Inc. The Geotechnical Investigation Report and associated Addenda are included in the Appendix of this Project Manual.

B. Data indicated on the subsurface conditions are not intended as representations, warranties of accuracy, or continuity between soil borings. It shall be expressly understood that Owner and Engineer shall not be responsible for interpretations or conclusions drawn from these reports by the Contractor. The information is made available for the convenience of the Contractor and is in no way, shape, or form considered a part of this Contract.

C. Contractor shall determine to Contractor's own satisfaction the nature and location of subsurface obstacles and the nature of soil and water conditions which will be encountered during the work.

D. Contractor may perform additional test borings or other exploratory operations at Contractor's own expense. Contractor shall make arrangements for any additional soils investigation with Owner.

E. No claim for additional payment will be accepted due to the nature of subsurface conditions in which the work is to be performed.

F. Do not commence construction of structure foundation until soil test results are confirmed.

1.06 SEQUENCING AND SCHEDULING

A. Backfill against concrete structures only after concrete has attained compressive strength, specified in Section 03 30 00, Cast-In-Place Concrete. Obtain Engineer's acceptance of concrete work and attained strength prior to placing backfill.

B. Backfill around water holding structures only after completion of satisfactory leakage tests as specified in Sections 03 30 00 and 33 31 13.

C. Construction of grade-supported slabs shall not occur immediately after below-grade walls are backfilled, so that post-compaction consolidation of the compacted backfills can be monitored to estimate how much the slabs could settle. Monitoring shall include the placement of grade stakes around the structure that shall be monitored weekly after construction. Results shall be reviewed by the Engineer to evaluate the rate at which post-construction settlements will occur. Settlement is estimated to be complete in less than 90 days.

1.07 PAYMENT

A. All excavation, removal, and disposal of earth, peat, muck, and other materials; erosion control; sheeting, shoring, and bracing; fill and backfill, placement, compaction, grading, source quality testing; stockpiling; and all other work under this Section shall be considered incidental to the Project and no claim for additional compensation of extra work will be accepted.

B. No claim for additional payment will be accepted for excavation and fill for all structures and improvements required for removal of unsuitable material up to two (2) feet below bottom of proposed piping invert elevation or two (2) feet below bottom of noted structural fill or *6" below minimum excavation limit for earthwork* as noted on the Drawings, whichever results in the greater excavation and fill.

C. Excavation and fill required for removal of unsuitable material deeper than the above limits will be paid for on a time and materials basis if conditions found in the Geotechnical Report are found to differ from actual conditions experienced on site. No additional payment will be made for conditions reflected in the Geotechnical Report.

D. No claim for additional payment will be accepted for repairs made to subgrade due to

weather related items.

1.08 FIELD MEASUREMENTS

A. Verify that survey benchmark, control point, and intended elevations for the Work are as shown on Drawings or will be provided by the Engineer.

1.09 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Field inspection and testing.

B. Compaction testing will be performed in accordance with ASTM D698, and ASTM D2922.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest at no additional cost to Owner.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.

B. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

C. Contractor shall excavate for piping and utilities at grades shown on the Drawings. Careful consideration shall be given to whether elevations shown are invert elevations or centerline elevations, Contractor shall make appropriate adjustment depending on elevation shown.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill around Structures: Backfill shall be as indicated on the Construction Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Notify utility company to locate utilities.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities that are to remain.

F. Contractor shall verify which native materials are suitable for reuse as granular foundation, bedding, encasement, and backfill material at the site. Provide testing data as required and keep materials separated.

G. Notify Engineer of any unsuitable materials or poor subgrade conditions.

H. Notify Engineer when structure or tank is ready for backfilling, and whenever backfilling

operations are resumed after a period of inactivity.

I. Dewater excavations during backfilling at no cost to Owner.

J. Dewater and dry saturated materials suitable for backfill at no cost to Owner.

K. Compact subgrade to density requirements for subsequent backfill materials.

L. Cut out soft areas of subgrade not capable of compaction in-place. Backfill with Type A or Type B fill and compact to density equal to or greater than requirements for subsequent fill material.

M. Identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.02 STOCKPILING OF MATERIALS

A. Stockpile according to Section 31 14 13.

3.03 FILLING, BACKFILLING, AND COMPACTING

A. The contractor shall follow the recommendations as provided in the Geotechnical Report by Pioneer Technical, Inc.

B. Surface compact excavations prior to installing fill material.

C. Proof roll subgrade areas, where noted with, as a minimum, a tandem axle dump truck loaded to at least 25 ton weight. Truck shall traverse the structure footprint to detect areas of loose or soft soils. Loose or soft soils shall be defined as soils exhibiting "excessive rutting" from the truck tires (approximately one (1) inch wheel rut depth.

D. Do not place material on muddy surfaces, frozen ground or on materials containing frost or ice.

E. Do not place fill required below structures until soil conditions encountered have been approved by special inspector.

F. Slope grade away from structures minimum 2 inches in 10 feet, unless noted otherwise.

G. Do not place material on or in water.

H. Do not proceed with backfilling of excavations until completion of the following:

1. Observation, testing, approval, and recording of locations of underground utilities.
2. Removal of concrete formwork.
3. Removal of shoring, bracing, other protection systems, and backfilling and compaction of voids left by their removals.
4. Removal of unsuitable materials, construction related debris, and excess materials.
5. Walls, including interior walls that brace exterior walls and intermediate floors and roof construction is installed, cured, and obtained required 28- day compressive strength.
6. When existing in-place soil materials are of density less than that specified, but the

soil material is acceptable, perform removal, filling, discing of ground surface, moisture-conditioning to within acceptable limits of the optimum moisture content, and compact to provide specified density and bearing capacity as recommended by soils testing laboratory.

I. Placement and Compaction

1. Place materials in compacted layers of thickness required to obtain specified soil densities. Layers shall not exceed 8 inches in loose depth for cohesive and cohesionless soil material, respectively, compacted by heavy compaction equipment and not more than 8 inches in loose depth for cohesive and cohesionless soil materials, respectively, compacted by hand operated tampers unless soil density tests substantiate specified densities will be obtained when material is placed in thicker lifts.
2. Place material in lifts uniformly to the same approximate elevation, not exceeding the final grade height, in manner required to prevent creation of unbalanced soil lateral pressures, wedging action of materials and soil pressures that exceed the design lateral soil conditions and to prevent damage to the structure.
3. Moisten or aerate each layer to the extent required to obtain the optimum moisture content required for the indicated compaction density. Prevent free water from appearing on surface during or subsequent to compaction operations.
4. Remove and replace with acceptable material, or scarify and air dry otherwise acceptable soil material that is too wet to obtain specified soil density. Assist drying by discing, harrowing, or pulverizing, until moisture content is reduced to value required for compaction.
5. Compact each layer to the required density specified for each area classification. Hand tamp or utilize hand operated vibratory equipment when required to compact material placed immediately adjacent to walls within 5 feet.
6. Do not place additional layers until density of each layer in place complies with compaction requirements. Perform corrective work as required to obtain required density. Cost associated with correction work and retesting at failed test locations shall be at Contractor's expense.
7. At door stoops place sand cushion to cross-section indicated on Drawings.

3.04 EMBANKMENTS

A. The contractor shall follow the recommendations as provided in the Geotechnical Report by Pioneer Technical, Inc.

B. Strip all topsoil, roots, and organic vegetation from embankment footprint. Excavate to design grade.

C. Dewater as warranted.

D. Subgrade soils should be moisture conditioned to plus or minus 3 percentage points from the optimum moisture content and compacted to a standard relative compaction of at least

95% as per ASTM D698.

E. Engineer shall approve subgrade prior to constructing embankments. Excavate or recondition and compact soft spots or unsatisfactory materials that are observed.

F. Where excavations are made in or to construct dikes, the backfill shall be placed in uniform lifts not exceeding 12" (twelve inches) **maximum** loose thickness, watered/dried to achieve optimum moisture content, and compacted to a minimum of 95% of the dry density as determined by ASTM D698 Standard Proctor Method.

G. All areas of the embankments that are not covered by a road or liner shall have 4" (four inches) of topsoil and be seeded to prevent erosion.

H. Uniformity of Backfill and Embankment

1. All backfill and embankment material shall be selectively placed to provide a uniform consistency of material throughout the fill.

2. A uniform moisture content shall be maintained at or near optimum throughout the fill to achieve maximum and uniform compaction.

3. All soft, spongy areas shall be excavated and the unstable material shall be replaced with suitable material and compacted as required.

I. Testing

1. All backfill, fill and embankments shall be tested by the Contractor and will be subject to inspection and testing by the Engineer. No further work shall proceed until all tests and inspections have been satisfactorily completed. Access to the work shall be given when requested.

   a. The Contractor is required to perform the compaction testing.

   b. The Engineer will spot check compaction only to determine the level of effort required to meet the compaction requirements. These tests will not constitute proof that the Contractor is meeting the compaction level required.

2. The following spot checks and inspections will be performed:

   a. Compaction of structural backfill, leveling course, fill and embankments.

   b. Materials quality.

   c. Grade and surface smoothness.

3.05 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by the Engineer as follows:

1. Beneath Existing Footings: Concrete of strength equal to respective footing.

2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.

3. Beneath Slabs on Grade: Aggregate fill.

4. Permanent Cut Slopes (Where overlying area is not to receive fill or backfill):

a. Flat to Moderate Steep Slopes (3:1 or flatter): Common fill.

b. Steep Slopes:

i. Correct overexcavation by transitioning between overcut areas and designed slope adjoining areas, providing such cutting does not extend offsite or outside easements and right-of-ways, or adversely impacts existing facilities or competed Work.

ii. Backfilling overexcavated areas is prohibited, unless in Engineer's opinion, backfill will remain stable, and overexcavated material is replaced as compacted common fill.

3.06 PLACING FILL OVER GEOSYNTHETICS

A. General:

1. Place fill over geosynthetics with sufficient care so there is no damage.
2. Place fill only by back dumping and spreading only.
3. Dump fill only on previously placed fill.
4. While operating equipment, avoid sharp turns, sudden starts and stops that could damage geosynthetics.

B. Hauling: Operate hauling equipment with a minimum 3 feet of covering.

C. Spreading:

1. Spreading equipment shall be track mounted low ground pressure, D-3 or lighter.
2. Operate spreading equipment on minimum of 12-inches of fill.
3. Spread fill in same direction as unseamed overlaps to avoid separation.
4. Limit distance material falls to maximum of 2 feet.
5. Flatten wrinkles in direction of spreading.
6. Maintain proper overlap of unseamed.
7. Avoid overstressing material and seams.

D. Geosynthetics Damage:

1. Mark punctures, tears, or other damage, so repairs can be made.
2. Clear overlying fill as necessary to repair damage.

3.07 COMPACTION REQUIREMENTS

A. Compact materials as required in Section 01 40 00.

B. Contractor shall re-compact all areas represented by failed density tests at their own expense.

3.08 TOLERANCES

A. Finished Grade:

1. Plus or minus 1 inch, upon completion of settlement in ditches, berms, and lawn areas.

2. Plus or minus 1 inch upon completion of settlement in roadways and driveways.

B. All areas that receive fill or backfill shall be kept within settlement tolerances through the warranty period.

3.09 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the Supplementary Conditions.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner, or sooner if required by Engineer or Owner, depending on the critical nature of the settlement.

3.11 SCHEDULE

A. Beneath Landscaped Areas:

1. Type A or B, to a minimum of 6 inches and a maximum of 18 inches below finish grade, compacted as specified in Section 01 40 00.

B. Beneath Buried Concrete Tanks, Package Plant Containers, and Generator slab:

1. Material: As indicated on the Construction Drawings and in Division 31.

2. Compacted Thickness: Equal, continuous layers not exceeding 8 inches compacted thickness. In the upper 12 inches of soil below the structures place compacted lifts no greater than 8 inches.

3. Place Geogrid and Goetextile fabric as shown in the Drawings.

4. Compaction: As specified in Section 01 40 00.

C. Beneath Concrete Slabs on Grade and Adjacent to Concrete Structures and for all pipe installations:

1. Material: As indicated on the Construction Drawings, Type A or B material per Section 31 05 13 unless otherwise indicated as granular material per Section 32 05 16 placed in compliance with the Drawings.

2. Compacted Thickness: Equal, continuous layers not exceeding 8 inches compacted thickness. In the upper 12 inches of soil below the pavement place compacted lifts no

greater than 8 inches.

3. Compaction: As specified in Section 01 40 00.

D. Fill to Correct Over-excavation:

1. Fill Type A, B as specified in Section 31 05 13, or granular material as specified in Section 32 05 16 as indicated on the Construction Drawings, flush to required elevation, compacted as specified in Section 01 40 00.

E. Sub-base Preparation:

1. As indicated on the Construction Drawings, Fill Type A or B as specified in Section 31 05 13, compacted in Section 01 40 00.

F. Beneath Asphalt:

1. Compact Subsoil as specified in Section 01 40 00.

2. As indicated on the Construction Drawings, Fill Type A or B as indicated on the Construction Drawings, compacted as specified in Section 01 40 00.

G. Topsoil Fill:

1. See Section 31 05 13.

END OF SECTION 31 23 21

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Excavating trenches for utilities.
2. Compacted bedding and fill of utilities to subgrade elevations.
3. Backfilling and compaction requirements for trenches.

B. Related Sections include, but are not limited to:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Soil Testing Laboratory: Refers to a professional soils engineering firm with soil sampling and testing services that is independent from the Contractor.

C. Suitable Material: Material that will provide the indicated required soil bearing capacity, soil densities, material requirements or, in the opinion of the soils testing laboratory, will not be subject to future decomposition, subsidence, settlement, or expansion.

D. Structures: Existing and new construction, including slabs, buildings, footings, tanks, and other structural elements.

1.03 SITE CONDITIONS

A. Soil borings were taken for this project by Pioneer Technical Services, Inc. The Geotechnical Investigation Report and associated Addenda are included in the Appendix of this Project Manual.

B. Data indicated on the subsurface conditions are not intended as representations, warranties of accuracy, or continuity between soil borings. It shall be expressly understood that Owner and Engineer shall not be responsible for interpretations or conclusions drawn from these reports by the Contractor. The information is made available for the convenience of the Contractor and is in no way, shape, or form considered a part of this Contract.

C. Contractor shall determine to Contractor’s own satisfaction the nature and location of subsurface obstacles and the nature of soil and water conditions which will be encountered during the work.

D. Contractor may perform additional test borings or other exploratory operations at

Contractor's own expense. Contractor shall make arrangements for any additional soils investigation with Owner.

E. No claim for additional payment will be accepted due to the nature of subsurface conditions in which the work is to be performed.

F. Do not commence construction of structure foundation until soil test results are confirmed.

1.04 ADDITIONAL PAYMENT

A. All excavation, removal, and disposal of earth, peat, muck, and other materials; erosion control; sheeting, shoring, and bracing; fill and backfill, placement, compaction, grading, source quality testing; stockpiling; and all other work under this Section shall be considered incidental to the Project and no claim for additional compensation of extra work will be accepted.

B. No claim for additional payment will be accepted for excavation of unsuitable material and fill for all structures and improvements to a depth of up to two (2) feet below bottom of proposed piping invert elevation or one (1) foot below bottom of noted structural fill or one (1) foot below minimum excavation limit as noted on the Drawings, whichever results in the greater volume of excavation and fill.

C. Excavation and fill required for removal of unsuitable material deeper than the above limits will be paid for on a time and materials basis if conditions found in the Geotechnical Report are found to differ from actual conditions experienced on site. No additional payment will be made for conditions reflected in the Geotechnical Report.

D. No claim for additional payment will be accepted for repairs made to subgrade due to weather related items.

1.05 FIELD MEASUREMENTS

A. Verify that survey benchmark, control point, and intended elevations for the Work are as shown on Drawings.

1.06 COORDINATION

A. Coordinate work under provisions of Section 01 31 13.

B. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

C. Contractor shall excavate for piping and utilities at grades shown on the Drawings. Careful consideration shall be given to whether elevations shown are invert elevations or centerline elevations, Contractor shall make appropriate adjustment depending on elevation shown.

PART 2 - PRODUCTS

2.01 GENERAL

A. Granular materials provided for foundation, bedding, encasement, and backfill or other

purposes shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, or slag that shall meet the gradation requirements specified herein for each specific use.

B. Granular materials provided for foundation, bedding, encasement, or backfill use shall be classified by use in accordance with the following requirements.

2.02 GRANULAR FOUNDATION

A. Granular foundation (pipe bedding) shall be placed below the bottom of the pipe invert as replacement for unsuitable or unstable soils to provide better pipe support.

B. Granular foundation material shall be Type A5 aggregate material as specified in Section 32 05 16.

2.03 GRANULAR BEDDING

A. Granular bedding shall be placed below the pipe midpoint, prior to pipe installation to facilitate proper shaping and achieve uniform pipe support. Minimum depth as indicated on the Construction Drawings. Place approved bedding material 4-inches under the pipe, around the pipe, and to a depth of 6- inches over the pipe.

B. Granular bedding material shall meet the requirements of Part 2.1 of Section 02221 - Montana Public Works Standard Specifications – (April 2010 Edition) and as indicated on the Construction Drawings.

2.04 SELECT TYPE I BEDDING

A. Select Type I Bedding may be placed from the springline of the pipe to 6" over the pipe for protection of the pipe.

B. Select Type I Bedding material if utilized, shall meet the requirements of Part 2.1.B of Section 02221 - Montana Public Works Standard Specifications – (April 2010 Edition) and as indicated on the Construction Drawings.

2.05 TRENCH BACKFILL

A. Between the top of pipe bedding (6" over top of pipe) to subgrade elevation, the trench backfill material shall meet the requirements of Part 2.2 of Section 02221 and Standard Drawing 02221-1 of Montana Public Works Standard Specifications – (April 2010 Edition) and as indicated on the Construction Drawings. Native materials unsuitable for trench backfill include those that are highly plastic, saturated or contaminated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, maintain, and protect utilities that remain from damage.

C. Notify utility company to locate utilities.

D. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Maintain and protect above and below grade utilities that are to remain.

G. Contractor shall verify which native materials are suitable for reuse as granular foundation, bedding, encasement, and backfill material at the site. Provide testing data as required and keep materials separated.

H. Notify Engineer of any unsuitable materials.

I. Dewater trench and structure excavations at no cost to Owner.

3.02 EXCAVATING

A. Excavate topsoil in accordance with Section 31 14 13.

B. Excavate trench to alignment and grade as required to meet foundation and bedding requirements as specified. Trench shall be centered on pipe alignment and no more than 100 feet of trench should be excavated in advance of pipe laying operations.

C. The trench width may vary and depend on the depth of trench, the diameter of pipe to be laid, and the nature of the material to be excavated, but in any case shall be of ample width to allow the pipe to be laid and joined properly and the backfill to be placed and compacted properly. The minimum bottom width of unsheeted trench shall be 18 inches. The maximum clear width of trench at the top of the pipe shall be not more than 32 inches greater than the outside diameter of the pipe for pipes 30 inches diameter and larger, or 18 inches greater for pipe under 30 inches in diameter. Wider trench widths at the top of the pipe shall be subject to approval by Engineer. The width of the trench at the ground surface shall be kept to a minimum to prevent unnecessary disruption of service structures.

D. If the trench width at the pipe zone is excavated to a greater width than the maximum, the Engineer may require the Contractor to provide a higher class of bedding and/or higher strength pipe that that required by the Contract Documents in order to satisfy pipe design requirements. In such case, no additional compensation shall be made for the higher class bedding or higher strength pipe.

E. Trench excavation shall be made by open cut methods. Trench sides shall be as vertical as possible and the trench shall be braced, sheeted, and drained such that the work may be performed safely in accordance with OSHA requirements.

F. Sheeting, shoring, and bracing shall be put in place and maintained as required due to soil stability or site constraints. Shoring, sheeting, and bracing shall be provided to prevent disturbance or settlement of adjacent surfaces, structures, foundations, utilities and other properties. Any damage to the work under contract or to existing adjacent structures or other improvements caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to lack of appropriate sheeting, shoring, or bracing shall be repaired at the Contractor’s expense at no delay.

G. Trench sheeting, shoring, and bracing shall be kept in place until pipe has been laid,

tested for defects, and repaired if necessary, and the earth around the pipe is compacted. The sheeting, shoring, and bracing shall be removed in such a manner as not to remove the constructed pipe or adjacent structures or other improvements.

H. It shall be the Contractor's responsibility for proper and adequate placement of sheeting, shoring, and bracing in accordance with all applicable regulations and standards.

I. Whenever unsuitable or unstable soil for properly supporting the pipe or structures is encountered, a further depth and/or width shall be excavated and replaced with the foundation material specified herewith or other suitable foundation material and thoroughly compacted to assure a firm foundation for the pipe.

J. Stockpile excavated material in an orderly manner, at sufficient distance from the trench to avoid overloading, to prevent slides and cave-ins.

K. Contractor shall advise Engineer immediately if any unsuitable materials are encountered during excavation. Unsuitable materials shall be reasonably separated form unsuitable materials and shall be considered surplus material at no additional cost to the Owner.

L. If Contractor encounters excess excavation materials which meet the requirements of common fill, Contractor may use those materials as fill in common execution and fill areas. Excess surplus materials shall be stockpiled.

M. Excavate to and over-depth of a minimum of 6 inches below pipe in areas of bedrock or other extensive rock formations by jack hammer, blasting, or other approved method. Trench width shall be 1.25 times the outside diameter of the pipe.

N. Remove unsuitable materials in accordance to the depth recommended by the soils testing laboratory beneath structures to obtain desired soil bearing capacity. Contractor shall notify Engineer prior to any additional excavation that is needed. Additional excavation shall be subject to approval by the Engineer and subject to additional payment as noted above.

O. Removal of materials beyond required subgrade elevations or dimensions without specific approval from soils testing laboratory and Engineer as well as backfilling, compaction, and other work at the over excavated area shall be at the Contractor's own expense.

P. Excavating and backfilling shall not be conducted in water. All excavations shall be maintained in a well drained condition at all times. Contractor shall provide and maintain temporary drainage facilities as required, and as approved by the Engineer, at no additional cost to the Owner.

Q. Do not interfere with 45 degree bearing splay of foundations. Underpin adjacent structures, as necessary, to prevent damage by excavation Work.

R. Hand trim for bell and spigot pipe joints. Remove loose matter.

S. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard, measured by volume.

T. In the event of shrinkage of excavated soils, resulting in shrinkage of backfill along trenches, Contractor shall provide, haul, place, and compact suitable soil type S1 or S2

from source at no cost to Owner.

U. Stockpile excavated material in an orderly manner, at sufficient distance from the trench to avoid overloading, to prevent slides and cave-ins. Remove excess material not being used from site.

3.03 PIPE FOUNDATION

A. Whenever unsuitable or unstable soil for properly supporting the pipe or structures is encountered, a further depth and/or width shall be excavated and replaced with the foundation material specified herewith or other suitable foundation material and thoroughly compacted to assure a firm foundation for the pipe.

B. Additional density testing may be required in unstable areas where unsuitable materials are found. Engineer shall determine stability of trench bottom.

C. Trench bottom shall be cut true and even so that the barrel of the pipe will have a bearing over the full length. Bell holes shall be excavated to ensure the pipe is resting for its entire length on the bottom of the trench and required bedding.

3.04 BACKFILLING

A. Pipe Zone

1. Should the materials available within the trench section be unsuitable or insufficient for this portion of the granular bedding, encasement and backfill materials as defined in this Specification, Contractor shall provide an approved material that meets the appropriate specifications.

2. Backfill materials shall be placed with care and deposited uniformly on both sides of pipe throughout the entire trench width in maximum 8-inch lifts. Mechanically compact material to required densities.

3. Flexible pipe shall be bedded in accordance with ASTM Specification D2321, “Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.” This shall include the placement of granular bedding and encasement materials from a point four (4) inches below the bottom of the pipe to a point six (6) inches above the top of the pipe compacted to required densities.

4. Placement and compaction of bedding, encasement, and backfill materials shall be consider incidental to the installation of the pipe.

B. Above Pipe Zone

1. Use suitable excavated materials from the site prior to importing of select granular borrow material. Any additional suitable select onsite borrow material required to be imported shall be provided by the Contractor at no additional cost to the Owner. Contractor shall separate out all unsuitable materials from select onsite borrow prior to installation. Excess surplus materials shall be removed from the Site.

2. If excavated materials are unsuitable for backfill (not as a consequence of being mis-managed by the Contractor), Contractor shall provide replacement imported backfill

as required to establish required subgrade elevation. Imported granular backfill shall meet the requirements outlined in Section 2.05 above.

3. Place backfill materials in uniform layers no more the 8 inches loose depth. Mechanically compact each layer of material to required densities.

4. Do not backfill unless approved compaction equipment is operating. The method of means of placement and type of compaction equipment used is at the discretion of the Contractor, however, all portions of the trench backfill must meet the compaction requirements. Tests to determine the compacted density of the backfill may be ordered by the Engineer if the compaction does not appear to be adequate.

5. The intent of this specification is to compact the backfill enough to prevent large settlements above the pipe, but to use as little effort as possible to avoid disturbing the pipe and bedding at the pipe zone.

C. Backfill trenches to contours and elevations with unfrozen fill materials.

D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

E. Aggregate Fill: Place and compact materials in equal continuous layers not exceeding 8 inches loose depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches loose depth.

G. Employ a placement method that does not disturb or damage utilities in trench. Prevent floatation of pipe.

H. Maintain optimum moisture content of fill materials to attain required compaction density. Use vibratory or special compaction equipment when required.

I. Remove surplus fill materials from site.

J. Leave fill material stockpile areas completely free of excess fill materials. Contractor shall have the responsibility to load, haul, and spread all excess fill off-site.

3.05 COMPACTION REQUIREMENTS

A. Compact according to Section 01 40 00 and Part 3.6 of Section 02221 - Montana Public Works Standard Specifications – (April 2010 Edition) and as indicated on the Construction Drawings.

B. Contractor shall recompact all areas represented by failed density tests.

3.06 TOLERANCES

A. Top Surface of Backfilling:

1. Plus or minus 1 inch, upon completion of settlement in ditches, berms, and lawn areas.

2. Plus or minus 1 inch upon completion of settlement in roadways and driveways.

B. Trenches shall be kept within settlement tolerances through the warranty period.

3.07 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Field inspection and testing.

B. Compaction testing will be performed in accordance with ASTM D698, and ASTM D2922.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest at no additional cost to Owner.

3.08 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.09 SCHEDULE

A. As Shown on the Construction Drawings in conformance with Geotechnical Report recommendations.

END OF SECTION 31 23 33

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Prevention of sedimentation of waterways, wetlands, and storm and sanitary sewers due to construction activities.

B. Restoration of areas eroded due to insufficient preventative measures.

C. Related Sections include, but are not limited to:

1. Division 02 – Existing Conditions
2. Division 31 – Earthwork
3. Division 32 – Exterior Improvements
4. Division 33 – Utilities

1.02 REFERENCES

A. Montana General Permit No. MTR100000 (or its successor), Effective Date October 12, 2009 and Expiration Date January 1, 2013 - Authorization to Discharge under the National Pollutant Discharge Elimination System.

B. Montana Department of Transportation (MDT) Erosion and Sediment Control Field Manual – Latest Edition

C. Montana Department of Transportation (MDT) Standard Specifications for Road and Bridge Construction – Latest Edition

D. Montana General Permit No. MTG070000 (or its successor), Effective Date October 12, 2009 and Expiration Date January 1, 2013 – General Permit for Construction Dewatering.

E. ASTM D 4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2005.

F. ASTM D 4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).

G. ASTM D 4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.

H. ASTM D 4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 2003).

I. ASTM D 4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

J. ASTM D 4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples, 2002.

1.03 SUBMITTALS

A. Provide product specification sheets for the following erosion control materials to demonstrate that the Contractor's proposed products meet the Contract Document requirements:

1. Fabric proposed for silt fence
2. Fiber Roll
3. Gradation tests for Construction Entrance stone material

PART 2 - PRODUCTS

2.01 SILT FENCE

A. Silt fence shall be a medium-duty, woven or non-woven polypropylene or polyethylene fabric that lets fluids pass through while trapping soil particles and preventing soil loss. The material shall meet the minimum characteristics of TENAX® silt fence.

2.02 SEDIMENT CONTROL LOGS

A. Prefabricated sediment control logs (SCR's) Rolls - As shown on Drawings. SCR's shall meet the minimum characteristic of the 12" Stenlog® as manufactured by Erosion Control Blanket/GSI.

2.03 CONSTRUCTION ENTRANCE

A. Materials as Shown on Drawings.

B. 3-6 inch Stone

1. Stone shall be angular and shall be comprised of hard, durable mineral materials that have been mechanically processed.
2. Stone shall not be from limestone/dolomite deposits that have thinly bedded strata or strata of a shale nature.
3. Stone gradation shall conform to the following:

SIEVE	PERCENT PASSING (by weight)
6-inch	100
3 ½-inch	50 – 100
3-inch	10 – 75
2-inch	0 – 10
3/8 inch	0 – 1

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. The Contractor shall develop a Storm Water Pollution Prevention Plan as required by the

Montana Department of Environmental Quality that meets both the State's requirements and the minimum practices shown on the Drawings.

B. The Contractor shall complete and sign the Notice of Intent and submit to the Montana Department of Environmental Quality.

3.03 PERFORMANCE REQUIREMENTS

A. Contractor shall comply with all requirements of the Montana Department of Environmental Quality along with all Federal, State, and Local permits and regulations for erosion and sediment control.

1. If erosion or sedimentation occurs due to non-compliance with any of these permits, Contractor shall restore eroded areas at no cost to Owner.

2. If sedimentation beyond permitted thresholds occurs in regulated waterways or wetlands, Contractor shall at no additional cost to the Owner:

a. Contact the authorities having jurisdiction;

b. Remove deposited sediments to the satisfaction of the Owner and the authorities having jurisdiction;

c. Install or correct preventive measures to the satisfaction of the authorities having jurisdiction; and

d. Pay any fines or other additional requirements of the authorities having jurisdiction; and

e. Meet the Contract schedule for project completion.

B. Contractor shall not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Obtain and pay for permits and provide security required by authority having jurisdiction.

C. Timing of erosion and sediment control practices: As Shown on the Drawings.

D. Erosion Control: Contractor shall reduce wind, water, and vehicular erosion of soil on project site due to construction activities for this project, consistent with approved permits and following these requirements:

1. Minimum erosion control measures as shown on the Drawings with additional practices implemented as required by the Contractor's SWPPP.

2. Control movement of sediment and soil from temporary stockpiles of soil.

3. Prevent development of ruts due to equipment and vehicular traffic.

4. Provide good site housekeeping.

5. Inspect, repair, maintain, and replace erosion control practices consistent with approved permits and as shown on the Drawings.

E. Sediment Control: Contractor shall reduce sediment transport off- site due to construction activities for this project, consistent with approved permits and following these requirements:

1. Minimum sediment control measures as shown on the Drawings with additional practices implemented as required by the Contractor's SWPPP.
2. Reduce windblown soil from leaving the project site.
3. Reduce tracking of mud onto public roads outside of the site.
4. Reduce mud and sediment from flowing onto sidewalks and pavements.
5. Inspect, repair, maintain, and replace sediment control practices consistent with approved permits and as shown on the Drawings.

3.04 CLOSE-OUT

A. Contractor shall file a Notice of Termination with the State following site stabilization that meets the requirements of the General Permit.

B. Contractor shall remove and clean up all temporary erosion and sediment control practices as shown on the Drawings. Site disturbance caused by removal of these practices shall be restored consistent with the surface restoration requirements shown on the Drawings. Costs for restoration shall be at Contractor's expense.

END OF SECTION 31 25 00

SECTION 31 41 00
SHORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Work related to sheeting, shoring, bracing, and excavation support systems needed to accomplish construction of buildings, tanks, facilities, utilities, and piping.

B. Related sections include, but are not limited to:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Section 03 30 00 – Cast-in-Place Concrete
3. Division 1 – General Requirement Specification Sections
4. Division 31 – Earthwork Specification Sections.

1.02 SUBMITTALS

A. Shop Drawings and Product Data: Submit, in accordance with Section 01 33 00. In general, include drawings and supporting calculations for shoring for Engineer review and approval.

B. Submittals shall include:

1. Excavation support plan.
2. Movement monitoring plan.
3. Trench excavation plan.
4. Movement measurement and data and reduced results indicating movement trends.
5. Documentation that shoring plan or system has been designed by a registered Professional Engineer if required.

C. Design calculations of bracing and shoring showing member stresses and connections due to imposed loads. Calculations shall be sealed by a qualified professional engineer.

1.03 QUALITY ASSURANCE

A. An OSHA approved competent person shall review the soil classification presented in the Geotechnical Report in the field. Excavations shall comply with the requirements of OSHA 29 CFR, Part 2926, Subpart P, “Excavations and Trenches.” Excavation safety is the responsibility of the Contractor. All excavations greater than 20 feet in depth shall be designed by a registered Professional Engineer.

B. Sheeting, shoring, and bracing shall conform to safety requirements of federal, state, and local agencies.

C. Sheeting, shoring, and bracing shall not affect structural integrity of existing structures,

utilities, or Work, and shall allow for sufficient clearances necessary to install associated appurtenances adjacent to new Work.

D. Sheeting, shoring, and bracing shall not penetrate walls or slabs of new Work unless approved by the Engineer.

E. Provide surveys to monitor movements of critical facilities.

1.04 REGULATORY REQUIREMENTS

A. Work outlined in this Section shall conform to OSHA regulations and all applicable codes and regulations for worker safety.

PART 2 - PRODUCTS

2.01 SHEETING, SHORING, AND BRACING

A. Type, design, detail, and installation of sheeting, shoring, and bracing shall be determined by and be the sole responsibility of the contractor.

PART 3 - EXECUTION

3.01 GENERAL

A. Design, provide, and maintain shoring, sheeting, and bracing as necessary to support the sides of excavations and to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work. Shoring, sheeting, and bracing shall also be provided as necessary to protect workers and the public.

B. Sheeting, shoring, and bracing shall be installed to prevent solids from entering excavation below or through sheeting.

C. Open cut excavations are to be evaluated by a registered Engineer and protected against surface water intrusion.

3.02 EXCAVATION SUPPORT PLAN

A. Prepare an excavation support plan addressing the following topics:

1. Select and install shoring system such that no adverse impact occurs on existing structures, utilities, or facilities.
2. Details of shoring, bracing, sloping, or other provisions for worker protection from hazards of caving ground.
3. Design assumptions and calculations.
4. Methods and sequencing of installing excavation support.
5. Proposed locations of stockpiled excavated material.
6. Minimum lateral distance from the crest of slopes for vehicles and stockpiled excavated materials.
7. Anticipated difficulties and proposed resolutions.

3.03 MOVEMENT MONITORING PLAN

A. Prepare movement monitoring plan addressing following topics:

1. Survey control.
2. Location of monitoring points.
3. Plots of data trends.
4. Interval between surveys.
    a. Interval shall not be less than once per week during performance of work until the permanent structure is complete to the ground level and shall continue weekly for a period of four (4) weeks after completion of the work (or longer if movement persists).
5. Remedial action and engineer notification plan should movement of existing structures occur during performance of the Work.

3.04 REMOVAL OF EXCAVATION SUPPORT

A. Remove excavation support in a manner that will maintain support as excavation is backfilled.

B. Do not begin to remove excavation support until support can be removed without damage to existing facilities, completed Work, or adjacent property.

C. Remove excavation support in a manner that does not leave voids in the backfill.

3.05 TRENCHES

A. Provide trench excavations exceeding four (4) feet in depth with adequate safety systems.

B. For trench excavation exceeding five (5) feet in depth, provide adequate safety systems meeting requirements of applicable state and local construction safety orders, and federal requirements.

END OF SECTION 31 41 00

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 05 16
AGGREGATES FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Aggregate materials.

B. Related Sections include, but are not limited to:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.
4. Division 32 – Exterior Improvements Specification Sections.
5. Section 31 23 21 – Fill and Backfill.
6. Section 31 23 33 – Trenching and Backfilling.
7. Section 32 11 23 – Aggregate Base Courses.
8. Section 33 31 19 – Site Piping.
9. Section 32 13 13 – Concrete Pavement.

1.02 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals: Procedures for submittals.

B. Samples: Submit, in air-tight containers, 40 pound sample of each type of aggregate to testing laboratory. Submit Laboratory Results to Engineer.

1.03 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Control: Field Samples.

B. Material Source: Submit name of imported material supplier(s). Provide materials from the same source throughout the Work. Change of source requires Engineer approval.

PART 2 - PRODUCTS

2.01 AGGREGATE MATERIALS

A. Coarse Aggregate (Concrete Mix and Type A1): Well graded crushed stone or gravel conforming to the requirements of ASTM C33, Gradation 67.

B. Coarse Aggregate (Surface Course and Type A2): Gravel; angular crushed, or natural stone; free of shale, clay, friable material and debris; graded in accordance with Montana Department of Transportation specifications. For all aggregate surface areas.

C. Coarse Aggregate (Base Course and Type A3): Gravel; Angular crushed, or natural

stone; free of shale, clay, friable material and debris; graded in accordance with Montana Department of Transportation referenced specifications, Section 816, Class 5.

D. Fine Aggregate (Concrete Mix and Type A4): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C33.

E. Coarse Aggregate (Type A5): All gravel for Granular Foundation shall be in accordance with the following table of gradations:

TABLE OF GRADATIONS – GRANULAR FOUNDATION	
Sieve Size	**Percent Passing**
4 inch (100 mm)	100
No. 4 (4.75 mm)	25-60
No. 200 (0.075 mm)	3-12

F. Granular Fill (Base course under cast-in-place on-grade slabs): Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1½ inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

G. Structural Fill (as described in the project drawings): Fully compliant with MPWSS Section 02234 – 1.5" Minus Sub-Base Course.

2.02 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Source testing and analysis of aggregate material.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698.

D. If tests indicate materials do not meet specified requirements, change material or material source and retest.

E. Provide materials of each type of aggregate from the same source throughout the Work.

PART 3 - EXECUTION

3.01 STOCKPILING

A. Stockpile materials in accordance with Section 31 14 13.

3.02 STOCKPILE CLEANUP

A. Cleanup stockpiles in accordance with Section 31 14 13.

END OF SECTION 32 05 16

SECTION 32 05 19
GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Geogrid fabric beneath asphalt road section;
2. Non-woven geotextile fabric beneath concrete foundations/slabs as indicated on the project drawings.

B. Related Sections include, but are not limited to:

1. The General Conditions, Supplemental Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specifications Sections.
3. Division 31 – Earthwork Specifications Sections.
4. Division 32 – Exterior Improvements.

1.02 REFERENCES

A. Reference Standards include, but are not limited to:

1. Montana Department of Transportation Standard Specifications, latest edition.
2. ASTM D6241 – CBR Puncture, Latest Edition.
3. ASTM D4355 – UV-Resistance, Latest Edition.
4. ASTM D4491 – Permeability, Latest Edition.
5. ASTM D4533 – Trapezoid Tear Strength of Geotextiles
6. ASTM D4632 – Grab Tensile Strength and Elongation, Latest Edition.
7. ASTM D4751 – Apparent Opening Size (AOS), Latest Edition.
8. ASTM D4759 – Determining Specification Performance for Geosynthetics
9. ASTM D4873 – Guide for Identification, Storage, and Handling of Geosynthetics, Latest Edition.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide product data on Geogrid and Geotextile Fabric.

C. Submit manufacturer’s installation instructions. Indicate special procedures and conditions requiring special attention.

1.04 DELIVERY, STORAGE, AND HANDLING

A. The geotextile rolls shall be furnished with suitable wrapping for protection against

moisture and extended ultraviolet exposure prior to placement.

B. Rolls shall be stored in a manner which protects them from the elements. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding fourteen days.

C. The geotextile rolls shall be labeled as per ASTM D 4873, "Guide for Identification, Storage, and Handling of Geosynthetics".

PART 2 - PRODUCTS

2.01 MATERIALS

A. Geogrid Fabric

1. The Geogrid fabric shall have the following minimum performance properties:

Property	Test Method	Value
Aperture Dimensions		1.3"
Rib Thickness		0.05"
Tensile Strength @ 2% Strain	ASTM D-6637	650 lb/ft
Tensile Strength @ 5% Strain	ASTM D-6637	580 x 920 lb/ft
Ultimate Tensile Strength	ASTM D-6637	1,970 lb/ft
Junction Efficiency	ASTM D-7737	93%
Flexural Rigidity	ASTM D-7748	750,000 mg·cm
Aperture Stability	ASTM D-7864	0.65 m·N/deg
Resistance to Installation Damage	ASTM D-5818 ASTM D-6637	95% SC; 93% SW; 90% GP
Resistance to LT Degradation	EPA 9090	100%
UV Resistance at 500 hr.	ASTM D-4355	100%

2. The Geogrid fabric shall be Tensar BX1200 Biaxial Geogrid or approved equal.

B. Non-Woven Geotextile

1. The non-woven geotextile fabric shall have the following minimum performance properties:

Property	Test Method	Value
% U.S. Manufactured		100%
Grab Tensile Strength	ASTM D-4632	205 lb.
Grab Elongation	ASTM D-4632	50%
CBR Puncture	ASTM D-6241	525 lb.

Trapezoidal Tear	ASTM D4355	80 lb.
UV Resistance at 500 hr.	ASTM D-4355	70%
Apparent Opening Size	ASTM D-4751	80 US Std. Sieve
Permittivity	ASTM D-4491	1.5 sec^{-1}
Water Flow Rate	ASTM D-4491	110 gpm/ft^2

2. Non-woven geotextile fabric shall be Geotex 801 by Propex Geosolutions – 4019 Industry Drive, Chattanooga, TN 37416.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify subgrade has been inspected, gradients and elevations are correct; surface is dry, and ready to receive Work.

3.02 PREPARATION OF SUBSOIL

A. Correct irregularities in subgrade gradient and elevation by scarifying a minimum of 6-inches, reshaping, and re-compacting.

B. Do not place on soft, muddy, or frozen surfaces.

3.03 PLACEMENT

A. Geotextile and geogrid fabric shall be placed in strict accordance with Manufacturer's recommendations.

B. The fabric shall be laid out smooth without wrinkles or folds on the prepared subgrade in the direction of the construction traffic.

C. Adjacent geotextile/geogrid rolls shall be overlapped a minimum of 2.5 feet; ends of rolls shall be overlapped 3 feet unless manufacturer specifies otherwise.

D. On curves, the fabric may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and shall be held in place by staples, pins or aggregate piles.

E. Damaged areas shall be repaired by overlaying the area with sufficient material to overlap on all edges by at least 2.5 feet.

F. The aggregate base material shall be placed by end dumping onto the geotextile/geogrid from the edge or over previously placed base aggregate. Construction equipment shall not be allowed directly on the geotextile fabric.

G. A minimum of 12 inches of aggregate must be placed on the geotextile/geogrid prior to the movement of construction equipment above the fabric.

H. Turning movements must be carefully monitored to avoid rutting of the aggregate. Any ruts occurring during construction shall be filled with additional gravel aggregate and compacted to the specified density.

I. If placement of the backfill causes damage to the geotextile/geogrid, the damaged area shall be repaired as described in Section 3.03.E.

J. Install in the locations as indicated on drawings.

3.04 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Assurance: Field inspection.

3.05 SCHEDULE OF LOCATIONS

A. Use Geogrid Fabric in the following locations:

1. Beneath asphalt roadway section
2. Where indicated in the project drawings

B. Use Geotextile Reinforcement in the following locations:

1. Beneath asphalt roadway section
2. Where indicated in the project drawings

END OF SECTION 32 05 19

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general requirements and procedures for furnishing and installing base and pavement courses, including:

1. Subbase Course.
2. Aggregate Base Course.

B. Related Sections include, but are not limited to:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Division 1 – General Requirement Specification Sections.
3. Division 31 – Earthwork Specification Sections.
4. Division 32 – Exterior Improvements.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)

B. American Concrete Institute (ACI)

C. American Society for Testing Materials (ASTM)

D. MDT Specifications (latest edition)

1.03 SUBMITTALS

A. Subbase Course

1. Provide appropriate material date source testing for each granular material. Include name location of source, date of testing, and sample gradations. Tests shall not be more than 180 calendar days before date of submittal.

B. Aggregate Base Course

1. Submit gradation report on sample of aggregate base to be used.

1.04 SEQUENCING AND SCHEDULING

A. Construct aggregate base only after all of the following have been completed:

1. Subgrade has been corrected for instability problems and successfully passed a rolling test performed by the Contractor and witnessed by the Engineer.
2. Subgrade has been checked for conformance to line and string tolerances (stringline).

B. Aggregate base to be completed and approved by Engineer prior to placement of bituminous surfaces.

1.05 QUALITY ASSURANCE

A. Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during work.

B. In-place finished thickness will not be acceptable if exceeding following allowable variation from thickness specified herein:

1. Aggregate Base Course: Plus or minus one-half inch.

PART 2 - PRODUCTS

2.01 SUBBASE COURSE

A. Subbase shall be Type A or B materials as specified in Section 31 05 16 unless otherwise indicated.

2.02 AGGREGATE BASE COURSE

A. Aggregate Base Course shall be as indicated on the Construction Drawings and as specified in Section 32 05 16.

2.03 AGGREGATE SURFACE COURSE

A. Aggregate Surface Course shall be as indicated on the Construction Drawings and as specified in Section 32 05 16.

PART 3 - EXECUTION

3.01 AGGREGATE BASE COURSE

A. Preparation:

1. Verify subsoil has been inspected; gradients and elevations are correct.
2. Prepare the sub-base course.
3. Verify subsoil is compacted to specified density and that subgrade test results have been submitted prior to placing aggregate course.
4. Subgrade to be completed and approved by Engineer prior to installation of the aggregate base course.
5. Verify subgrade is dry.

B. Construction Requirements; conform to MDT Specifications:

1. Place aggregate in maximum 6-inch layers and compact to specified density. When placing over geotextile fabric, place in minimum 8 inch layers.
2. Level and contour surfaces to elevations and gradients indicated.
3. Compact by mechanical means as specified in Section 01 40 00.
4. Install aggregate base in accordance with Detail Drawings.
5. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

6. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

C. Field Quality Control:

1. The Owner shall have an independent testing laboratory sample the aggregate base materials, determine the moisture/density relationships and gradation, and perform field moisture/density tests at locations determined by Engineer.

2. If, during progress of Work, tests indicate that compacted materials do not meet specified requirements, remove defective Work, replace, and retest. Contractor shall bear all costs associated with repair and retesting of defective Work.

3.02 TOLERANCES

A. Finished Grade:

1. Line and Grade Tolerance: The final aggregate base surface will be checked for conformance to specified tolerances by the "stringline" method prior to approval to pave the surface. Grade shall be ± 0.03 feet of grade.

END OF SECTION 32 11 23

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Bituminous Pavement.

B. Related Work:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.

1.02 REFERENCES

A. Reference Standards include:

1. ASTM D946 – Penetration-Graded Asphalt Cement for Use in Pavement Construction.
2. ASTM D1559 – Test of Resistance to Plastic Flow of Bituminous Mixtures. Using Marshall Apparatus.
3. ASTM D2950 – Test for Density of Bituminous Concrete in Place by Nuclear Methods.
4. TAI – (The Asphalt Institute) – MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
5. TAI – (The Asphalt Institute) – MS-3 Asphalt Plant Manual.
6. TAI – (The Asphalt Institute) – MS-8 Asphalt Paving Manual.
7. TAI – (The Asphalt Institute) – MS-19 Basic Asphalt Emulsion Manual.
8. Montana Department of Transportation (MDT) Standard Specifications for Road Construction and Bridge Construction, 2008 Edition.

1.03 SUBMITTALS FOR REVIEW

A. Section 01 33 00 – Submittals: Procedures for submittals.

B. Product Data: Furnish data on aggregates, asphalt cement, bituminous mixtures, and other materials required for the mix in accordance with Section 01 33 00 and 01 40 00 at least 7 days prior to beginning paving operations.

C. Asphalt Mix Formula.

1.04 PERFORMANCE REQUIREMENTS AND QUALITY ASSURANCE

A. When referenced, perform Work in accordance with the Montana State Highway

Department standard Specifications for Road and Bridge Construction, latest edition.

B. Paving: Designed for H20 classification.

C. Mixing Plant and Mixing Plant Operations: Conform to the Montana State Highway Department Standard Specifications for Road and Bridge Construction, latest edition, and The Asphalt Institute (TAI) MS-3 Asphalt Plant Manual.

D. Obtain all materials from same source throughout project unless approved by the Engineer.

E. Paved surfaces shall be warranted against any materials and/or workmanship defects for a period of twelve months from placement.

F. The mix design and development of the Job Mix Formula shall be generated by a laboratory accredited by the AASHTO Materials Reference Laboratory (AMRL) at the Contractor's expense.

1.05 REGULATORY AND ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air temperature (in the shade and away from artificial heat) or base surface temperature is less than 40 degrees F. or when surface is wet, dirty, or frozen.

B. No Work will be permitted in the spring until the frost has disappeared and the subgrade is stable so as to support the equipment without rutting, shoving, pumping, or other displacement.

C. Conform to applicable code for paving work on public property.

D. Conform to Section 01 50 00. Minimize interference with traffic.

E. Conform to the Montana Department of Environmental Quality Clean Air Standards and Storm Runoff Surface Water Standards.

F. Dispose of all waste material or reject material by approved methods.

1.06 SEQUENCING AND SCHEDULING

A. Construct aggregate base only after all of the following have been completed:

1. Subgrade has been corrected for instability problems and successfully passed a rolling test performed by the Contractor and witnessed by the Engineer.

2. Subgrade has been checked for conformance to line and string tolerances (stringline).

B. Aggregate base to be completed and approved by Engineer prior to placement of bituminous surfaces.

C. The Contractor shall provide a 48 hour notice for scheduling prior to paving operations.

D. Contractor shall allow aggregate base, asphalt base course, and curb to undergo one freeze thaw cycle before installing surface course. Aggregate base course, asphalt base course, and curb installation shall be required for final completion with surface course of asphalt required for final completion.

PART 2 - PRODUCTS

2.01 GENERAL

A. Asphalt Cement: Asphalt Cement shall be produced in accordance with Section 818 of the MDT Standard Specification and meeting the following requirements:

1. ASTM 6373 (AASHTO M320) Asphalt Binder have a PG grading of:
2. PG 58-28

B. Aggregate for Mix:

1. Section 02510 in accordance with the MPW Standard Specifications for Asphalt Concrete Pavement, latest edition.
2. MPW Section 02510 Part 2.2 Table 1

TABLE 1 – Percentage by Weight Passing Job Mix Target Bands				
Sieve Size	Type A	Type B	Type C	Job Mix Tolerances
1"	100	----	----	----
3/4"	91-93	100	----	+/- 7
1/2"	76-89	83-93	100	+/- 7
3/8"	61-79	13-87	91-93	+/- 7
No 4	41-54	47-63	51-71	+/- 6
No 10	31-39	32-43	34-46	+/- 6
No 40	16-27	15-25	16-26	+/- 5
No 200	4-7	5-7	5-9	+/- 2

C. Asphalt Paving (Bituminous) Mixture (Base Course) shall have the following properties:

1. The Engineering shall approve the job mix formula submitted by the Contractor. Once the job mix formula is established, all mixtures furnished for the Project shall conform within the following maximum permissible variation: TYPE A in table 1 from 2.01 B
2. The asphalt mixture shall have the following test properties:

a. Marshall Stability.....…. 1200 lbs. (minimum)
b. Marshall Flow (units of 0.01 in.)..... 8 to 18
c. Air Voids..... 3 to 7 percent

3. Adjustment of the job-mix base course formula may only be made with written approval of the Engineer.

D. Asphalt Paving (Bituminous) Mixture (Wear Course) shall have the following properties:

1. The Engineering shall approve the job mix formula submitted by the Contractor. Once the job mix formula is established, all mixtures furnished for the Project shall conform within the following maximum permissible variation: TYPE B in table 1 from 2.01 B

2. The asphalt mixture shall have the following test properties:

a.	Marshall Stability.....	1200 lbs. (minimum)
b.	Marshall Flow (units of 0.01 in.).....	8 to 18
c.	Air Voids.....	3 to 5 percent

3. Adjustment of the job-mix wear course formula may only be made with written approval of the Engineer.

E. Tack Coat:

1. SS1H and CSS1H Emulsion meeting the appropriate requirements of ASTM for the specific grade of emulsion and the MDT Standard Specifications. Non-tracking tack products may also be used as approved by the Engineer.

2. Water should be clean and free of impurities, either in solution or colloidal suspension. The presence of ions, both positive and negative, must be carefully monitored.

3. Storage and handling of the emulsion should be performed in accordance with MS-19.

4. All conventional asphalt emulsions shall be diluted with water at a 50:50 ration. Polymer modified and non-tracking emulsions shall not be diluted. Dilution of the emulsion product should be performed at the emulsion terminal or in a tank at the asphalt plant. Emulsion should not be diluted in the distributor at the project site.

5. Never allow asphalt emulsion to freeze.

6. Use pumps with proper clearances for handling to avoid binding and seizing. Avoid repeated pump cycling or frequent pumping.

7. DO NOT mix different classes, grades, or types of emulsified asphalt in storage tanks, transports, or distributors. Make sure tanks are totally clean before changing to another class, grade, or type.

8. Always pump from bottom of tank.

9. Never overheat asphalt emulsion.

2.02 PAVEMENT MARKING PAINT

A. Paint shall be J.E. Bauer Company, Traffic Paint; Tnemec, Traffic Paint; Glidden-Durkee, Romark Traffic; PPG, Traffic & Zone Marking Paint; or equal.

B. Provide paint striping and logos as shown on the Drawings.

C. Provide colors as selected by the Engineer from the manufacturer's standard color range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry, stable, compacted to specified density, at proper temperature, and to proper elevations and grade slopes. Do not begin asphalt-paving construction without Engineer's authorization.

B. Each course shall be compacted and hardened to such a degree that it will not be displaced or otherwise damaged before another course may be placed thereon.

3.02 PREPARATION

A. Notify Engineer and Owner at least 72 hours in advance of temporary disruptions of traffic along route of construction.

B. Saw cut and tack all joints between new and existing pavement.

C. For asphalt overlay sections, mill a one (1) foot strip along all edges of the overlay area.

D. The Contractor shall review the proposed paving sequence with the Engineer prior to placement of bituminous course.

E. All surfaces shall be checked and approved by the Engineer prior to paving.

F. Existing courses must be dry prior to and during placement of any bituminous pavements.

G. Wearing course shall not be placed when the air temperature in the shade and away from artificial heat, is 50°F or less, unless otherwise approved by the Engineer.

H. Pavement shall not be installed on frozen or thawing ground.

3.03 TACK COAT

A. All equipment shall conform to MDT Standard Specifications for Road and Bridge Construction, latest edition, Section 151.

1. Tack distributor shall be designed, equipped, maintained, and operated so that tack material is applied at the specified rate per square yard with uniform pressure over the required width application.

2. The distributor shall be equipped with an onboard computer that determines the relationship between the distributor travel speed and pump speed to ensure a consistent application rate.

3. An accurate and calibrated thermometer with a range covering the specified application temperature for tack material shall be mounted at approximately center height of the tank with the stem extending into the tack material.

4. The distributor shall have a full circulating system with a spray bar, adjustable laterally and vertically. The spray bar shall be maintained at a constant height above the pavement under variable load conditions.

5. Ensure that all nozzles are of the same size and type to ensure uniform application of emulsion.
6. Ensure that all nozzles are at the same angle to ensure uniform application of emulsion.
7. The distributor shall be checked and calibrated. A certificate of the calibration shall be posted in the driver's compartment stating that the distributing system is in good working condition and when used with the charts and instructions furnished by the manufacturer will give the required results. The certificate shall bear the date of calibration and signature of the calibrating agency.

B. Always maintain proper distributor spray bar height and spray nozzle angle for proper coverage.

C. Always maintain proper distributor speed.

D. Always sweep and clean surfaces to be tack coated.

E. Never apply more tack coating than can be covered by the same day's operation.

F. Never apply tack coating when ambient air temperature is consistently below 40º F or when surface is wet.

G. Never over-spread tack coating. If "fat spots" develop, spread out excess oil by pneumatic tire rolling before placing pavement.

H. Always allow enough time for tack coat to "break" before placing pavement.

I. Apply tack coat as directed in Section 401 of the MDT Standard Specifications for Road and Bridge Construction, latest edition and NAPA's Best Practices for Emulsion Tack Coats. Hand spray wands and crack-sealing buckets are not acceptable methods of applying tack coat emulsion except on the vertical face of an adjoining lift of pavement.

J. Apply bituminous tack coat to existing bituminous pavement and to the surface of each lift or course constructed, other than the final course. Apply in a uniform rate with no missed areas permitted. Application rates shall be approved by the Engineer prior to commencing Work.

K. The bituminous tack coat shall be applied at a uniform rate of not less than:

1. 0.10 gallons per square yard, for undiluted asphalt emulsion (as supplied from the emulsion terminal); application rate shall be adjusted if necessary to attain bond between courses.
2. 0.20 gallons per square yard, for diluted asphalt emulsion (with water added at the terminal or plant emulsion tank).

L. The temperature of emulsion shall be between 70 and 160 degrees F at the time of application.

M. Apply immediately prior to the placement of the next bituminous course or lift. Do not allow public traffic on tack coated areas. The tack coat shall be applied in a manner that offers the least inconvenience to traveling public.

N. Apply the tack coat on the same day as the proposed surfacing is to be performed. Where emulsified asphalt is specified, dilute one part of water to one part of emulsion and apply the mixture at two times the undiluted rate of application. Allow water to evaporate completely before beginning paving operations. At request of Contractor, Engineer may approve a change in the dilution ratio of the water- emulsion mixture. Sampling and testing of the emulsion product will be performed at the discretion of the Engineer.

3.04 ASPHALT PAVEMENT CONSTRUCTION

A. All mixtures shall be spread and finished with a self-propelled, bituminous paver, to the required section, leaving the mixture uniformly dense, smooth, and free from irregularities.

B. The speed of the bituminous paver shall be controlled to place the mixture uniformly and continuously without tearing or gouging. The speed shall not exceed the Manufacturer's recommendation, and shall be coordinated with the output of the plant to provide for a smooth, continuous operation, minimizing starting and stopping.

C. Perform test strip compaction in field under observation of Engineer to determine the percentage of the asphalt mixture's maximum density achievable. If, in the Engineer's opinion, Contractor is unable to achieve the specified density corresponding with 95 percent of the maximum Marshall density (ASTM D1559), Contractor shall achieve an asphalt compaction equaling or exceeding that obtained in the test strip.

D. Compact pavement by rolling to specified density as follows:

1. Compaction shall consist of initial or breakdown rolling, intermediate rolling, and final or finish rolling with rollers meeting all requirements of MDT Standards Specifications and which are approved by the Engineer.

2. Breakdown rolling shall consist of one or more complete coverages with a rubber tired roller.

3. Breakdown rolling shall be followed by intermediate rolling with either a rubber tired roller or a vibratory steel roller and shall be continued until the surface is tightly bound and shows no displacement under the roller.

4. Intermediate rolling shall be completed before the mat temperature falls below 185º F.

5. Final rolling shall be performed with a steel roller and shall continue until roller marks are eliminated. Contractor may be required to modify rolling sequence to best suit the construction conditions.

6. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

7. Compaction shall be a minimum of 92% of the daily theoretical maximum density (ASTM D-2041).

E. Uniformly blend pavement surface into elevations at curbs, valve box castings, and other critical points of contact. Place pavement so that the pavement is ¼" higher than the edge

of the structure after the pavement has been compacted.

F. Do not allow drainage to be impeded or casting covers to become difficult to remove.

G. All transverse and longitudinal joints, high or low areas, and surface irregularities, shall be leveled, filled, or raked prior to compaction. Any loose material dropped on previously compacted lanes shall be removed immediately.

H. Ensure joints made during paving operations are straight, clean, vertical, and free of broken or loose material. Joints shall be tacked and constructed with adequate bond on abutting surfaces. Vertical construction joints in successive courses shall be placed so that joints do not fall on the same vertical plane.

I. Rolling shall begin at the edges and proceed parallel to the road centerline, each trip overlapping the previous roller pass. On paving an echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. Rolling shall begin at the low elevation and progress to the high elevation by overlapping of longitudinal passes, paralleling the centerline. Displacement resulting from reversing the direction of a roller or from other causes shall be corrected immediately.

J. The sequence of rolling operations and the selection of type and number of rollers shall be commensurate with production, and shall be adequate to obtain the specified density before the mat temperature falls below 185º F.

K. Install all bituminous pavement 3-inches and greater in thickness in a minimum of two lifts. Maximum thickness of a base course lift shall be 3-inches.

L. Ensure surface of completed asphalt pavement is true to lines, profiles, and elevations indicated and matches existing grade.

M. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

N. The surfaces of previously placed layers shall be swept and a tack coat applied before spreading the next layer.

O. The overall thickness shown on the Drawings shall be the minimum finished, in- place, compacted thickness of bituminous pavement.

P. Protect newly paved surfaces from traffic and mechanical injury until surface has cooled to 140°F.

Q. Any low or high defective areas shall be corrected immediately. Corrective Work shall include patching, cutting out the surface and replacing with fresh, hot bituminous mixture, or by milling the surface.

R. Clean up paving area.

S. Ensure manhole covers are clean of all asphalt material and tack coat and returned to the condition they were prior to asphalt paving activities.

3.05 PAVEMENT MARKINGS

A. Remove all dirt, oil, grease, and other foreign material from areas of pavement to be marked. Contractor is responsible for all preparation and layout.

B. Apply paint only on thoroughly dry surfaces when atmospheric temperature is above 40 °F and when weather is favorable.

C. Apply respective markings in colors as indicated and sizes and dimensions as indicated, or match existing colors and markings.

D. Contractor shall replace and/or restore all pavement markings after temporary patching or Work has removed such markings.

E. Contractor shall maintain pavement markings as required during all phases of construction.

F. Apply painted permanent pavement markings with a maximum coverage rate of 100 square feet per gallon with a 0.015 inch minimum film thickness on bituminous and concrete paved areas, and 0.020 inch minimum film thickness on seal coated areas.

G. Apply paint with atomizing spray type striping machine. Markings shall have clear- cut edges, true and smooth alignment, and uniform thickness. Do not permit traffic on pavement until markings are thoroughly dry. Other pavement markings shall be painted with the standard templates in an appropriate proportion.

H. Apply respective markings in colors as indicated and sizes, locations, and dimensions as follows:

1. All parking stalls to be marked with 4” wide striping, color as indicated on Drawings.

2. Crosswalk markings shall be as indicated on Drawings.

3. Pavement arrows, lettering, and symbol dimensions shall conform to MUTCD Standards.

4. All handicapped parking stalls shall be marked with striping and symbols in accordance with Owner and ADA Standards. Handicapped stalls to include both van accessible and non-van accessible. Locations as directed by Owner, or as shown on the drawings. Color shall be blue.

I. Contractor shall be responsible to replace and/or restore all pavement markings after temporary patching or other Work has removed such markings.

3.06 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Control: Field inspection and testing.

B. Perform field and laboratory testing by an independent testing laboratory appointed and paid for by the Contractor.

C. Determine maximum density in accordance with ASTM D2041, and compact each course in the field to a density not less than 92 percent of the Maximum Density attained by the

theoretical maximum density method.

D. Perform field density testing in accordance with ASTM D2950; minimum frequency of one test per 2,000 square feet per lift, or once per day, whichever is more frequent. Ensure that the density gauge is properly calibrated and correlated to core density tests for the mix being used.

E. Notify testing laboratory to perform density tests when testing is to be performed during construction. Do not proceed with additional Work until results have been verified.

F. If, during progress of Work, tests indicate that compacted materials do not meet specified requirements, remove defective Work, replace, and retest. Contractor to bare all costs associated with defective pavement Work.

G. Perform gradation analysis of aggregate once for each 500 tons of mix produced, as construction progresses. Test base course and wear course for oil content and air voids to differentiate different mix designs.

3.07 TOLERANCES

A. Flatness: Maximum variation of 3/16 inch measured with 10-foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch of specified thickness.

C. Variation from true elevation: Within 1/4 inch.

D. Variation from horizontal location: Within ¼ inch.

E. Transverse slope of surface course shall not vary from the slope shown on Drawings by more than plus or minus ¼ inch in 12 feet.

F. Asphalt cement content within 0.24% of approved mix design as determined by daily cutoff report.

END OF SECTION 32 12 16

SECTION 32 90 00
LANDSCAPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Seeding (also see Section 32 90 19).
2. Planting.
3. Erosion control mulch.
4. Hydro-mulch.
5. Erosion control mat.
6. Turf reinforcement mat.
7. Hardwood mulch.
8. Landscaping materials.
9. Fertilizer.
10. Landscape maintenance.
11. Landscape warranty.

B. Related Sections

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork Specification Sections.
4. Division 32 – Exterior Improvements.

1.02 DEFINITIONS

A. Growing Season: May 1 through September 30

B. Weeds – Any vegetation that is either not planted or seeded that is within areas to be seeded or planted as part of this Contract.

C. Planting Bed – Planted areas around the package plant containers, buried concrete tanks, generator pad and the lift station building.

D. Noxious Weeds – As defined by the MDT Standard Specifications

1.03 REFERENCES

A. Montana Standard Specifications for Road and Bridge Construction, 2008 edition, referred to as MDT Standard Specifications in this specification section.

B. General Permit No. MTR100000 (or its successor), Effective Date January 1, 2013 and

Expiration Date December 31, 2017 - Authorization to Discharge under the National Pollutant Discharge Elimination System, referred to as the State's Construction General Permit in this specification section.

1.04 SUBMITTALS FOR REVIEW

A. Section 01 33 00 – Submittal Procedures.

B. Seed Data: Provide seed testing data and labeling consistent with MDT Standard Specifications.

C. Plant Material: Include quantities, sizes, quality and sources for plant materials.

D. Submit samples or product data sheets and installation specifications/details of the following materials (if applicable). Contractor shall not place materials until Engineer reviews submittal and provides a submittal review noting no exceptions taken:

1. Landscape Rock
2. Landscape Gravel
3. Hardwood Mulch
4. Erosion Control Mulch, including anchoring approach
5. Hydro-Mulch
6. Erosion Control Mat
7. Weed Control Barriers
8. Landscape Edging

E. Proposed seeding equipment and methods.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 – Closeout Procedures for submittals.

B. Maintenance Data: Include maintenance instructions for all seeding and planting areas including cutting / pruning method and maximum height; types, application frequency, and recommended coverage of fertilizer and/or mulching.

1.06 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies and MDT Standard Specifications for herbicide, insecticide, pesticide, and fertilizer application rates and composition.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 60 00 for product delivery, storage, and handling requirements.

B. Deliver seed mixture in sealed containers, open or damaged packaging is not acceptable.

C. For Engineer's field review, each bag of seed delivered to the site shall bear a tag with labeling meeting MDT Standard Specification requirements.

D. Deliver fertilizer in waterproof bags, labeled according to state law and bearing weight,

chemical analysis, name of manufacturer, and warranty of producer.

E. Deliver plants after preparations for planting have been completed, and install within the same working day. Prior to planting:

1. Set plants in cool, covered, and shaded area;
2. Protect from weather;
3. Protect from mechanical damage;
4. Keep roots moist.

1.08 PLANTING BED ESTABLISHMENT PERIOD

A. The Planting Bed Establishment Period shall begin immediately after installation, with the approval of the Engineer, and continue for forty-five (45) growing season days within the same growing season, seventy-five (75) growing season days if the growing season spans more than one calendar year, or thirty (30) days after Substantial Completion, whichever is latest.

B. During the Planting Bed Establishment Period the Contractor shall:

1. Water all plants to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of one (1) inch of absorbed water per week either through natural rainfall or augmented by periodic watering. Apply water at a moderate rate so as not to displace the hardwood mulch or flood the plants and turf.
2. Prune plants and replace hardwood mulch as required.
3. In planting beds, remove grass, weeds, and other undesired vegetation, including the root growth, before they reach a height of 3 inches and/or re-seed, whichever comes first.
4. Spray with approved insecticides and fungicides to control pests and ensure plant survival in a healthy growing condition, if recommended by a certified horticulturalist.
5. Mechanically remove or spot spray with approved herbicide all weeds.
6. Remove plants that die during the Planting Bed Establishment Period and replace each plant with one of the same size and species, following the specifications for allowable planting schedule.

1.09 SEEDING BED ESTABLISHMENT PERIOD

A. The Seeding Bed Establishment Period shall begin immediately after installation, with the approval of the Engineer, and continue until:

1. A Notice of Termination can be filed for the State’s Construction General Permit, and meeting all the requirements of the State’s Construction General Permit; and
2. No single bare area is greater than 36 square feet.

B. During the Seeding Bed Establishment Period the Contractor shall:

1. Water all seeded areas to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of one (1) inch of absorbed water per week either through natural rainfall or augmented by periodic watering. Apply water at a moderate rate so as not to displace the mulch or seed flood the plants and turf.
2. Mechanically remove or spot spray noxious weeds prior to reseeding and such that noxious weeds are less than 10 percent of the overall coverage in the Seeding Bed, with no area greater than 100 square feet that is more than 50 percent noxious weed coverage at the end of the Seeding Bed Establishment Period.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Per specification Section 31 05 13.

2.02 SEED

A. Area surrounding as defined on the project drawings: Seed shall be Premium Sunny Brand Lawn or Classic Shade/Sun Brand Mixtures as provided by Agassiz Seed & Supply or approved equal.

B. Seed shall meet MDT Standard Specifications, except the following additional provisions shall apply / supersede the MDT Standard Specifications:

1. Seed shall have a minimum 80 percent germination rate and maximum inert matter and other seeds of 4%. Maximum weed seed shall be 0.5 percent.
2. Seed shall be tested within six months prior to date of seeding and conform to latest seed laws of the State of Minnesota. A certified test report shall be submitted to the Engineer at least 21 days before seeding begins.
3. Origin of native species shall be limited to North Dakota, eastern Montana, South Dakota, or western Minnesota.

C. Temporary cover crop, if used, shall be per MDT Standard Specifications.

2.03 FERTILIZER

A. Fertilizer shall meet MDT Standard Specifications. In the case where both Class I and Class III seed are applied, the Class III fertilizer will apply.

2.04 EROSION CONTROL MULCH

A. Erosion control mulch shall meet the MDT Standard Specifications.

2.05 HYDRO-MULCH

A. Hydro-mulch shall meet the MDT Standard Specifications.

2.06 EROSION CONTROL MAT

A. Erosion Control Mat shall be classified as ECB 2, as outlined in Table 856-1 of the MDT

Standard Specifications.

2.07 TURF REINFORCEMENT MAT (TRM)

A. As shown on the Drawings.

2.08 HARDWOOD MULCH

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of 2” ground or shredded bark in its natural color.

2.09 LANDSCAPE ROCK

A. Landscape rock shall be water worn river rock 20 percent maximum jagged edges 3/4-inch to 1 1/2-inch diameter, ASTM C33.

2.10 LANDSCAPE GRAVEL

A. Landscape gravel shall be as shown on the Drawings.

2.11 LANDSCAPE EDGINGS

A. As shown on the Drawings.

2.12 WEED-CONTROL BARRIERS

A. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8oz/sq. yd.

2.13 PLANT MATERIAL

A. Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings.

B. Plants shall have healthy root systems developed by transplanting or root pruning. Plants shall not be pot bound.

C. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

D. Contractor shall not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

E. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required.

F. Labeling:

1. Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species.

2. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

PART 3 - EXECUTION

3.01 TOPSOIL PREPARATION

A. Verify that prepared topsoil meets the topsoil and grading specifications and is ready to receive work of this Section.

B. Kill all weeds prior to planting or seeding.

1. For broad removal of weeds, Contractor shall use disking or mechanical removal.

2. Herbicide shall only be allowed for spot spraying and if the herbicide will not have a detrimental effect on the intended seeded or planted species.

C. Fill all depressions to provide a smooth grade. Sticks, stones, and other rubbish on the surface shall be raked and removed.

D. Seeding: Immediately prior to sowing seed, soil shall be loosened to a depth of approximately three (3) inches all areas except slopes steeper than 2 horizontally to 1 vertically, using discs, harrows, or other suitable equipment.

E. Planting: Immediately prior to planting, soil shall be dug and loosened to a depth of approximately 1.25 times the pot depth and diameter using hand or rotary drill equipment.

F. On slopes, the cultivating equipment shall operate in a general direction at right angles to the direction of surface drainage.

G. On slopes steeper than 2 horizontally to 1 vertically, no loosening of the soil will be required except that created by equipment used in the finishing operations.

3.02 SEEDING BEDS

A. Seed all disturbed areas designated for revegetation.

B. Stake out areas to receive different seed mixes.

C. Seeding Equipment Requirements.

1. The specified seed or seed mixture shall be drilled in uniformly using a grass drill equipped with individually mounted adjustable spring loaded, double disk furrow openers fitted with depth bands and packer wheels. The drill furrow spacing shall not exceed 8 inches. The depth control bands shall be of a size to provide final planting depth of ½ to ¾ inch. Packer wheels shall have adjustable spring tension and be mounted individually on each furrow opener or be mounted independently with a press wheel situated to follow directly behind each opener. The seed box shall be equipped with a positive feed mechanism which accurately meters free flowing introduced (tame) grasses in a uniform manner and shall have agitators which prevent seed bridging. If chaffy native grasses are part of the specified seed mixture, the seed box shall be equipped with a positive feed picker-wheel mechanism with oversize teeth and augur style agitators which accurately meters the chaffy native grasses either in a mixture or separately in a uniform manner. The seed box shall have baffles or partitions that keep all seeds uniformly mixed during drilling.

2. Equipment to be used when Hydro-Mulch seeding is required shall be hydraulic equipment capable of uniformly mixing the specified seed in water for uniform distribution. The mulch may be applied simultaneously with the seed and fertilizer, or within 24 hours after application of seed and fertilizer.

3. Other Equipment. Power sprayers, blowers, hydraulic applicators, or broadcasters may be used on slopes steeper than 3:1 or areas too small to be seeded with a drill. The seeding rate shall be at least 120% of the normal rate, and the seed shall be covered by operating a drag harrow and a light packer over the seeded area.

4. Areas will be visually inspected for uniformity of application. Areas which do not reveal adequate and uniform coverage shall be reseeded at the Contractor's expense.

D. Seasonal considerations for seeding shall be implemented per MDT Standard Specifications, Section 708.02C1d.

E. No seed shall be sown when the wind velocity exceeds 15 miles per hour, in standing water, or on frozen ground.

F. Do not sow within 24 hours after a rain event.

G. Within the same work day, Contractor shall stabilize the soil surface with the appropriate surface stabilization (erosion control mulch, hydro-mulch, or erosion control mat) as shown in these specifications and/or the Drawings. Hydro-mulch shall be applied at the same time as seeding, unless approved by Engineer.

H. Following surface stabilization, Contractor shall water seeded areas consistent with the Seeding Bed Establishment Period requirements.

3.03 PLANTING BEDS

A. Contractor shall plant areas more than 30 days prior to the end of the Growing Season to limit the potential for frost heave.

B. Do not plant when soil is excessively wet.

C. Stake out and space plants as indicated on Drawings, in even rows with triangular spacing.

D. Use topsoil for backfill.

E. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

F. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

G. Within one hour of planting, Contractor shall spread hardwood mulch as shown on the Drawings and water planting areas with sufficient water consistent with the Planting Bed Establishment Period requirements, taking care not to cover plant crowns with wet soil or hardwood mulch.

3.04 SURFACE STABILIZATION

A. Erosion Control Mulch shall be applied according to MDT Standard Specifications at a rate of 2 tons per acre with approximately 10 percent of the soil surface visible. Contractor shall anchor the mulch using either the punching or tackifier approach.

B. Hydro-Mulch shall be applied per MDT Standard Specifications at a rate of 1 ton per acre with a minimum of 95 percent coverage.

C. Erosion control mat shall be installed per the Drawings and manufacturer's recommendations, whichever is more stringent.

D. Turf Reinforcement Mat shall be installed per the Drawings, which may include placing the TRM below the ground surface prior to seeding with an erosion control mat on the surface, if recommended by the manufacturer.

3.05 LANDSCAPE ROCK AND GRAVEL PLACEMENT

A. Landscape rock and gravel will be placed in areas identified in the Specifications and Drawings at a uniform depth of four inches, plus or minus 1 inch.

B. Provide a two (2) foot wide border of landscape rock at all structures not adjacent to asphalt or concrete surfaces.

C. Place landscape gravel on areas shown on the ADM landscaping plan noted with "Gravel" label.

D. Place weed control barrier and landscape edging (5-inch) prior to placement of landscape rock and gravel.

3.06 CLEANUP AND PROTECTION

A. During and after landscaping, keep pavements clean and work area in orderly condition.

B. Protect existing improvements from damage from landscaping operations.

C. Contractor shall clean up the site following work and repair any damage caused by landscaping operations, at Contractor's cost.

3.07 MAINTENANCE

A. Contractor shall be responsible for maintenance of the planting and seeding beds for the Planting and Seeding Bed Establishment Periods, respectively.

B. Contractor shall spot spray weeds in the landscape gravel and landscape rock areas before they reach a height of 3 inches and/or re-seed, whichever comes first.

C. If Contractor has used a temporary cover crop, Contractor shall mow temporary cover crop prior to cover crop re-seeding.

3.08 WARRANTY

A. For Seeding Beds:

1. Initial Acceptance:

a. All seeding beds shall be evaluated for Initial Acceptance after the seeding beds

have been covered with the specified seed and the specified soil protection measure (such as erosion control mulch or mat) as shown on the Drawings. Initial Acceptance shall be based on the Contractor providing the Engineer with the specified submittals and a visual inspection by the Contractor and Engineer of the seeding beds.

2. Maintenance:
    a. Contractor shall maintain the seeding beds, consistent with the Seeding Bed Establishment Period, until Final Acceptance.
    b. Other maintenance activities may be completed at the Contractor's discretion to meet the Final Acceptance performance criteria. Contractor shall notify the Engineer of planned additional maintenance activities prior to implementation.
3. Final Acceptance:
    a. Final Acceptance will occur at the end of the Seeding Bed Establishment Period.
    b. If after a period of ninety (90) growing season days, vegetation coverage does not meet the minimum requirements outlined in the Seeding Bed Establishment Period, Contractor shall re-seed all areas that do not meet the minimum coverage, at Contractor's cost. A new Seeding Bed Establishment Period shall begin, except the maintenance period will be thirty (30) growing season days.

B. For Planting:
1. Initial Acceptance:
    a. All planting areas shall be evaluated for Initial Acceptance after the plants have been installed and surrounding planting beds covered with hardwood mulch. Initial Acceptance shall be based on the Contractor providing the Engineer with the specified submittals and a visual inspection by the Contractor and Engineer of the planting beds.
2. Maintenance:
    a. Contractor shall maintain the planted beds, consistent with the Planting Bed Establishment Period, until Final Acceptance.
    b. Other maintenance activities may be completed at the Contractor's discretion to meet the Final Acceptance performance criteria. Contractor shall notify the Engineer of planned additional maintenance activities prior to implementation.
3. Final Acceptance:
    a. Final Acceptance will occur at the end of the Planting Bed Establishment Period.
    b. Prior to Final Acceptance, the Engineer shall determine if planted materials are in a healthy condition.
    c. Contractor shall replace all dead or visibly dying plants consistent with the planting bed execution requirements.

d. All replacement and associated repair activities shall be at the Contractor's expense.

e. Contractor shall maintain newly planted areas for a period of fifteen (15) days.

END OF SECTION 32 90 00

SECTION 32 92 19
SEEDING
(Reference MPWSS Section 02910)

All applicable portions of MPW standard specification Section 02910 shall apply with the following additions, deletions and/or modifications.

PART 2 - PRODUCTS

2.01 SEED

Add following:

E. Seed mixtures shall be proportioned as follows:

1. Dryland Seed.

Seed Species or Variety	Seed Mix %	Application Rate
Western Wheatgrass	20%	21 lbs. Per acre
Pryor Slender Wheatgrass	20%	
Crituna Thickspike Wheatgrass	30%	
Sudar Stream Bank Wheatgrass	20%	
Canada Bluegrass	10%	

Note: All seed shall be 98% pure and shall have a germination percentage of 90%. Do not sow immediately following rain, when ground is to dry, or during windy periods. Apply water with fine spray after seeding. Saturate to 3 inches of soil.

2. Lawn or Turf Grass Seed.

Lawn or turf grass seed shall be a blend of at least 24 percent Kentucky Bluegrass plus a blend of at least three other bluegrasses in approximately equal proportions. Acceptable blend grasses include Adelphi, Silkins, Birka, Nuglade, Rambo, Ram Eclipsey, Quantum, Merian, Nustar or others commonly used in the area by sod producers.

2.02 TOPSOIL

Add the following:

1. Topsoil shall be the existing top 6-12 inches of silty sand surface layer of soil at the site with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (1.0 inches or more in diameter), clay lumps or similar objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary herbaceous growth such as grass and weeds do not need to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The Contractor will be required to compact the topsoil to reduce settling and ensure a uniform grade in the disturbed areas.

2.04 FERTILIZER

Add the following:

C. Fertilize uniformly across all surfaces at the following rate:

Dryland Grass

Nitrogen	25 lbs/acre
Phosphate	25 lbs/acre

Lawn Grass

Nitrogen	50 lbs/acre
Phosphate	50 lbs/acre

2.05 MULCH

Add the following:

A. Mulch with a loose 1-inch layer of straw.

PART 3 - EXECUTION

Add the following:

3.05 CARE OF SEEDED AREAS

D. All weeds including (spotted knapweed, leafy spurge, and all others identified by the State of Montana as non-native) shall be controlled by the Contractor while grass is becoming established and during the full one year warranty period after the project is complete and accepted by the Owner. Chemical control may be utilized where permitted by State Laws and regulations.

PART 4 - MEASURMENT AND PAYMENT

DELETE: Entire Section

END OF SECTION 32 92 19

SECTION 32 92 23
TOPSOIL AND SODDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section

1.02 GENERAL

A. This section covers the work necessary to furnish, haul, and place approved topsoil and live sod on prepared areas at the locations shown on the Drawings or as directed by the Engineer.

1.03 SUBMITTALS

A. The following submittals for construction shall be made in accordance with the project submittal requirements as described in the Supplementary Conditions.

1. Topsoil particle size analysis; characterization; acidity; salinity; organic matter percentage.
2. Sod supplier name, address and telephone number.
3. Grass mixture contained in sod.
4. Manufacturer's Fertilizer Data Sheets.

PART 2 - MATERIALS

2.01 TOPSOIL

A. Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials.

B. The topsoil shall consist of sandy loam, with soil particles within the following percentages: clay; 0-25; silt; 25-50; sand; 50-70; decomposed organic matter; 5-10.

C. The clay content is optional.

D. The soil shall have a soil acidity range between a pH 5.0 to pH 7.0. The soil salinity

E. shall not exceed 3 millimhos per centimeter at 25oC (as described by USDA Circular

F. No. 982).

G. The Contractor shall notify the Engineer of the source of topsoil not less than 10 days prior to excavation.

2.02 SOD *(Sod not included in the Flathead Lake Biological Station Project)*

A. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period.

B. All sod shall be obtained from areas where the soil is reasonably fertile and contains a

high percentage of loamy topsoil.

C. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials which might be detrimental to the development of the sod or to future maintenance.

D. Sod shall be 100 percent Kentucky Bluegrass.

E. Before harvesting, the turfgrass shall be mowed to a uniform height of not more than 5/8".

F. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than 2 inches.

2.03 WATER

A. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

PART 3 - EXECUTION

3.01 GENERAL

A. Areas to be solid, strip, or spot sodded are shown on the Drawings. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition which are to remain undisturbed shall also be shown on the Drawings.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Engineer and replace with new planting soil

C. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

D. Uniformly moisten excessively dry soil that is not workable or which is dusty.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARING THE GROUND SURFACE

A. Placing and spreading of topsoil shall not be done when the ground is frozen, excessively wet or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation. Compaction of topsoil will not be required.

B. After placement is completed the surface of the topsoil shall be finished to a reasonably smooth surface.

C. After application of the topsoil and grading of areas has been completed and before applying fertilizer, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with

sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

D. All areas to receive sod or turf grass seed shall have the native material properly scarified, a minimum of 6" of approved topsoil applied and lightly rolled, prior to installation of the sod or seed.

E. Over-compaction the topsoil at any time before or during application of the sod or seed is not acceptable.

3.03 APPLYING FERTILIZER

A. Following ground surface preparation, fertilizer shall be uniformly spread at the rates specified below.

1. All areas shall be fertilized with an inorganic chemical fertilizer with the following nutrients:

a. Nitrogen (Elemental) 40 lbs/acre

b. Phosphorus (P205) 60 lbs/acre

c. Potassium (K20) 30 lbs/acre

3.04 OBTAINING AND DELIVERING SOD *(Sod not included in the Flathead Lake Biological Station Project)*

A. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside.

B. The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

3.05 LAYING SOD *(Sod not included in the Flathead Lake Biological Station Project)*

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not

stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. After establishment, if necessary to smooth surface, tamp and roll lightly to remove surface undulations. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. On slopes exceeding 1:6, and in V-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wood pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

C. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

D. The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1 inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

3.06 WATERING

A. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

3.07 ESTABLISHING TURF

A. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

B. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

C. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment,

depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

3.08 REPAIRING

A. When the surface has become bullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be re-sodded.

END OF SECTION 32 92 23

SECTION 32 97 00
RESTORATION OF DISTURBED AREAS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Restoration of all areas disturbed during construction.
2. Restoration of all items not specifically identified for restoration, but damaged through construction.

B. Related Sections include:

1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
2. Division 1 – General Requirements Specification Sections.
3. Division 31 – Earthwork.
4. Division 32 – Exterior Improvements.

1.02 REFERENCES

A. Reference Standards include:

1. Montana State Highway Department Standard Specifications for Road and Bridge Construction, latest edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Material Sections include:

1. Topsoil and Sodding: Per Section 32 92 23.
2. Aggregate Materials: Per Section 32 11 23.
3. Seed: Per Section 32 92 19.

PART 3 - EXECUTION

3.01 EXECUTION

A. Observe all surface features requiring protection, removal and replacement, and/or restoration prior to construction.

B. The Contractor shall be responsible for the preservation of all public and private property and shall protect carefully from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

C. The Contractor shall be responsible for all damage or injury to property of any character

during the prosecution of the Work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the Work, or at any time due to defective Work or materials, and said responsibility will not be released until the Project shall have been completed and accepted.

D. When any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to the condition similar or equal to that existing before such damage or injury was done by repairing, rebuilding, or otherwise restoring as may be directed or he shall make good such damage or injury in an acceptable manner.

3.02 RESTORATION

A. Restore all areas disturbed by construction to a condition equal to or better than existed prior to construction.

B. Replace, restore, repair, or otherwise make good any damage done to any tree, bush, or shrub that is not specifically designated for removal.

C. Restore items such as culverts, road signs, power poles, sodding, fences, driveways, mailboxes, and like, whether or not specifically identified on the Drawings, to a condition equal to or better than existed before construction.

D. Replace or repair all concrete or asphalt roads or driveways, removed or damaged during construction with equal or better materials. Replace or repair to match existing conditions.

E. Stabilize subgrade sufficiently to prevent mixing of granular material with subgrade prior to application of base material.

F. Place topsoil per Section 32 92 23 and seed areas disturbed by construction in grassed areas per Section 32 92 19.

G. All damage to streets, driveways, berms, etc. due to the Contractor’s construction techniques and equipment shall be repaired at the Contractor’s expense prior to final payment.

H. Remove all excess dirt, concrete, and other debris from work area immediately upon completion of Work and deposit on-site in a disposal area designated by Owner. Contractor shall be required to clean site to the condition prior to the start of construction before final payment will be made.

I. All restoration shall be completed prior to opening any section of Work.

END OF SECTION 32 97 00

DIVISION 33

UTILITIES

SECTION 33 01 10.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Disinfection of potable water system.
2. Testing and reporting results.

B. Related Sections include, but are not limited to:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 40 00 – Quality Control.
3. Section 01 77 00 – Closeout Procedures.
4. Section 33 31 19 – Site Water Utility Distribution Piping.

1.02 REFERENCES

A. Reference Standards include, but are not limited to:

1. AWWA B300 - Standard for Hypochlorites.
2. AWWA B301 - Standard for Liquid Chlorine.
3. Federal Specifications BB-C-12a, O-C-114a, and O-C-602b.
4. AWWA C651 – Disinfection of Water Mains.
5. Montana Public Works Standard Specifications.

1.03 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01 33 00.

B. Test Reports: Indicate results comparative to specified requirements

1.04 DEFINITIONS

A. Disinfectant Residual means the concentration of disinfectant in the treated water.

B. PPM means parts per million.

1.05 QUALITY ASSURANCE

A. Regulatory Agency Requirements: Comply with Montana Department of Environmental Quality (DEQ) requirements.

B. Perform work in accordance with AWWA C651 for the disinfection of water main

C. Testing Firm: Company specializing in testing potable water systems, approved by the DEQ. Contractor shall obtain sampling bottles from an approved laboratory and perform sampling per project requirements and sampling protocol. Contractor shall coordinate sampling and testing schedule with the laboratory. Contractor shall pay all testing fees

and lab costs.

D. Submit bacteriologist's signature and authority associated with testing.

E. The cleaning and disinfection work shall be conducted prior to connection to the existing water lines or to any portion that has been put into service. Unless otherwise approved, hydrostatic testing shall be completed prior to final cleaning and disinfection.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect against damage and contamination.

B. Maintain caution labels on hazardous materials.

C. Maintain storage room dry and with temperatures as uniform as possible between 60 and 80 degrees F.

D. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 33 00 – Submittal Procedures and Section 01 77 00 – Closeout Procedures.

B. Disinfection report:

1. Type and form of disinfectant used.
2. Date and time of disinfection.
3. Test locations.
4. Initial and final disinfectant residuals (quantity in treated water) in ppm for each test.
5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each location test.

C. Bacteriological report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and final disinfectant residuals in ppm for each test location.
6. Coliform bacteria test results for each test.

PART 2 - PRODUCTS

2.01 ACCEPTABLE DISINFECTION CHEMICALS

A. AWWA B300, Hypochlorite: Shall conform to Federal Specification O-C-114a, Type II,

Grade B, or Federal Specification O-C-602b.

B. AWWA B301, Liquid Chlorine: Shall conform to Federal Specification BB-C- 120a.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Do not start Work until conditions are satisfactory.

C. Select one form of chlorine for use in disinfection.

D. Flush mains thoroughly before introduction of chlorinating material. Maintain flushing velocity in main of not less than 2.5 feet per second unless the Engineer determines that conditions do not permit the required flow to be discharged to waste.

3.02 DISINFECTION OF WATER SYSTEMS

A. Provide and attach required tools, equipment, and materials to perform the Work of this Section. Disinfectant material shall be introduced into the water system in a manner approved by the Engineer. For wells, add the required amount of chlorination material into the casing before installation of pumping equipment. Agitate as required for thorough mixing.

B. Use of calcium hypochlorite granules for use on solvent welded plastic or on screwed joint steel pipe is prohibited because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

C. Perform disinfecting in accordance with AWWA C651 prior to start-up. Coordinate with other Contractors, Engineer, and Owner.

D. Inject treatment disinfectant into piping system to obtain 50 to 80 ppm residual.

E. Test for disinfectant residual at each of the following locations:

1. End of piping runs.

F. Maintain disinfectant in system for 24 hours. If disinfectant residual is less than 25 ppm, repeat system treatment.

G. All water supply and distribution mains shall be disinfected with chlorine prior to acceptance by the owner.

H. As chlorinated water flows past new fittings and valves, related valves shall be operated so as to disinfect appurtenances and pipe branches. All valves shall be opened and closed several times during the contact period.

I. Drain and flush using fresh water pumped through the system.

J. Flush heavily chlorinated water from main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system.

K. Provide bacteriological test at Owner or Engineer’s request.

L. Any sections of equipment in contact with water shall be swabbed with a chlorine solution prior to installation.

M. Properly dispose of heavily chlorinated water supply in an environmentally acceptable manner.

N. Contractor shall pay all testing costs.

3.03 BACTERIOLOGICAL TESTING

A. After disinfection and flushing, test water for bacteriological contamination. Samples for bacteriological analysis shall be collected in sterile bottles obtained from the testing laboratory and submitted for testing.

B. Samples shall be taken from the hydrants. Duplicate samples shall be collected from each hydrant.

C. Two or more successive test samples indicating bacteriological satisfactory water shall be obtained before facility is placed into operation.

D. If contamination is shown to be still present in the water supply, the disinfection procedure shall be repeated.

E. All testing costs shall be paid by Contractor.

3.04 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Field inspection and testing.

B. Samples for bacteriological analysis shall be collected in sterile bottles.

C. Two or more successive test samples indicating bacteriological satisfactory water shall be obtained before any system is placed into operation.

END OF SECTION 33 01 10.58

SECTION 33 05 26
UTILITY IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Tracer Wire
2. Marking tape

B. Related Sections include, but are not limited to:

1. Section 01 33 00 – Submittals.
2. Section 31 23 33 – Trenching and Backfilling.
3. Section 33 31 13 – Site Sanitary Sewerage Piping
4. Section 33 31 19 – Site Water Utility Distribution Piping.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Submit manufacturer's data on materials furnished indicating compliance with the specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Tracer Wire:

1. All water distribution piping and forcemains shall be installed with tracer wire meeting all the requirements of NEC as well as ASTM B-3, ASTM B170, ASTM D1248 and ASTM D1238. Approved tracer wire is Pro-Line Type Cu HDPE 30 mil manufactured by Pro- Trace/Pro-Pak Industries, or approved equal.

B. Marking Tape:

1. "Terra Tape" as manufactured by REEF Industries, Inc., or Omega Marking Company.
2. Size: 3”.
3. Marking Tape Schedule and Warning Notice:

Pipeline	Warning Notice	Color
Sanitary Sewer	Caution Buried Sewer Line Below	Green
SS		
Force Main	Caution Buried Force Main Below	Green
AIR / FDD/ IMLR / VFA / RAS / SCM / WAS		
Potable Water Main	Caution Water Line Buried Below	Blue
PW		
Non Potable Water	Caution Non Potable Water Line Buried Below	Purple
NPW		
Electric	Caution Electric Line Buried Below	Red
Gas	Caution Gas Line Buried Below	Yellow
OTHERS	Caution ---------- Buried Below	TBD

PART 3 - EXECUTION

3.01 INSTALLATION

A. Tracer Wire

1. Install coated copper wire, taped to the top of pipe, and thermite welded to valve body on all water mains and forcemains

B. Marking Tape

1. Install the marking tape 24" below finished grade directly above and parallel with pipelines. Marking tape shall be installed for all site piping outlined in Sections 33 31 13, 33 31 19 and the Piping Schedule and shall be labeled in accordance with this section.

2. At each manhole, bring the marking tape up to the manhole to a point approximately 24 inches below finished grade.

END OF SECTION 33 05 26

SECTION 33 31 00.10
ABANDONMENT OF PIPING AND MANHOLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. This section includes abandonment in place of existing pipelines and manholes as indicated on the drawings for abandonment.

B. Related Sections include, but are not limited to:

1. Section 01 31 00 – Project Management and Coordination
2. Section 01 33 00 – Submittal Procedures
3. Section 01 40 00 – Quality Requirements
4. Section 31 23 33 – Trenching and Backfilling

1.02 REFERENCES

A. Reference Standards include, but are not limited to:

1. ASTM C150 – Standard Specification for Portland Cement.
2. ASTM C494 – Standard Specification for Chemical Admixture for Concrete.
3. ASTM C618 – Standard Specification for Fly Ash and raw or Calcined Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.
4. ASTM C940 – Standard test Method for Expansion and Bleeding of Freshly Mixed grout for Replaced Aggregate Concrete in the Laboratory.
5. ASTM C1017 – Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.
6. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (NonShrink).

1.03 DEFINITIONS

A. Abandonment: Pipeline abandonment consists of filling or plugging portions of existing manholes and pipelines with compacted base course, flowable fill or grout plugs, as indicated on the Drawings.

B. Bank Run Sand. Bank run sand shall be a locally available sand material to be used in abandoning existing manholes.

C. Flowable Fill. Flowable fill shall be controlled low-strength material consisting of fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in pipelines or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. Long- term hardened strength shall be within

specified range.

D. Backgrouting. Secondary stage pressure grouting to ensure that voids have been filled within abandoned pipes. Backgrouting will only be required at critical locations indicated on the Drawings or if there is evidence of incomplete flowable fill placements.

1.04 SUBMITTALS

A. Submit flowable fill mix design report (if applicable).

1. Flowable fill type and production method. Describe if fill will be mixed to final proportions and consistency in batch plant or if constituents will be added in transit mixer at placement location.

2. Aggregate gradation of fill. Aggregate gradation of mix shall be used as pilot curve for quality control during production.

3. Fill mix constituents and proportions including materials by weight and volume, and air content. Give types and amounts of admixtures including air entrainment or air generating compounds.

4. Fill densities and viscosities, including wet density at point of placement.

5. Initial time of set.

6. Bleeding and shrinkage.

7. Compressive strength.

B. Submit sand gradation to be used in abandoning manholes.

C. Submit technical information for equipment and operational procedures including projected injection rate, grout pressure, method for controlling grout pressure, bulkhead and vent design and number of stages for grout application.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with Section 01 40 00.

1.06 PROJECT CONDITIONS

A. Verify all dimensions of and between existing structures and locations of existing piping and equipment required for the proper abandoning of existing piping.

B. Contractor shall be responsible for verification of location of all existing piping and structures. Potholing and or excavation to expose existing piping, conduits, etc. may be required prior to installation of new piping or connection to existing piping. Adjustments to the locations of new piping may be required due to locations of existing piping and sequencing of construction that will be required. Adjustments required shall be at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 FLOWABLE FILL (if utilized)

A. Design Mix Criteria. Provide design of one or more mixes to meet design criteria and

conditions for placement. Present information required by submittals, to include the following:

1. Cement: ASTM C150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 50 pounds per cubic yard.
2. Fly ash: ASTM C618, Class C or F. Volume and weight per cubic yard of fill. Provide minimum fly ash content of 200 pounds per cubic yard.
3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.
4. Aggregate gradation: 100 percent passing 3/8-inch sieve and not more than 10 percent passing No. 200 sieve. Mix design report shall define pilot gradation based on following sieve sizes: 3/8 inch, No. 4, 8, 16, 30, 50 100 and 200. Do not deviate from pilot gradation by more than plus or minus 10 percentage points for any sieve for production material.
5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent natural aggregate to provide workability.
6. Admixtures: use admixtures meeting ASTM C494 and ASTM C1017 as needed to improve pumpability, to control time of set and to reduce bleeding.
7. Fluidifier: Use fluidifier meeting ASTM C937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.
8. Performance additive: Use flowable fill performance additive, if needed, to control fill properties.

B. Flowable Fill Requirements:

1. Unconfined compressive strength: minimum 75 psi and maximum 150 psi at 56 days as determined based on an average of three tests for same placement. Present at least three acceptable strength tests for proposed mix design in mix design report.
2. Placement characteristics: self-leveling.
3. Shrinkage characteristics: non-shrink.
4. Water bleeding for fill to be placed by grouting method in pipes: not to exceed 2 percent according to ASTM C940.
5. Minimum wet density: 90 pounds per cubic foot.

C. Grout Plugs

1. Cement-based dry-pack grout conforming to ASTM C1107, Grade B or C.
2. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned.

2.02 BASE COURSE MATERIAL

1. Base course used in the abandonment of manholes shall be in conformance with Parts 2.01.A, B, C and E of Section 32 05 16

2.03 BANK RUN SAND

A. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D2487) meeting following requirements:

1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D1140. Amount of clay lumps or balls may not exceed 2 percent.
2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D4318: Plasticity index: not exceeding 7.
3. Engineer shall consider locally available materials not meeting the above criteria on a case by case basis.

PART 3 - EXECUTION

3.01 CUTTING AND CAPPING OF MAINS

A. Do not begin cut, plug, and abandonment operations until replacement pipe has been constructed and tested, all service connections have been installed, and main has been approved for use.

B. Install plug, clamp, and concrete reaction block and make cut at location shown on drawings.

C. Pipe to be abandoned shall not be valved off and shall not be cut or plugged other than as shown on drawings.

D. After pipe to be abandoned has been cut and capped, check for other sources feeding abandoned pipe. When sources are found, notify Engineer immediately. Cut and cap abandoned pipe at point of other feed as directed by Engineer.

E. Plug or cap ends or opening in abandoned pipe in manner approved by Engineer. Install concrete around cap and over pipe to ensure it’s not penetrable by groundwater.

F. Remove and dispose of surface identifications such as cleanouts, curb boxes, and valve boxes.

G. Backfill excavations in accordance with Section 31 23 33.

3.02 PREPARATION FOR ABANDONMENT VIA FLOWABLE FILL

A. Have fill mix design reports and other submittals required by Submittals accepted by Engineer prior to start of placement. Notify Engineer at least 24 hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not distort or imperil portion of work, new or existing.

C. During placement of fill, compensate for irregularities in existing pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.

D. Perform demolition work prior to starting fill placement. Clean placement areas of debris that may hinder fill placement. Remove excessive amounts of sludge and other substances that may degrade performance of fill. Do not leave sludge or other debris in place if filling more than 2 percent of placement volume.

E. Remove free water prior to starting fill placement.

3.03 EQUIPMENT FOR FLOWABLE FILL

A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design.

B. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

3.04 INSTALLATION OF FLOWABLE FILL

A. Abandon existing piping underneath roadway and paved areas by completely filling pipe with flowable fill.

B. Continuously place flowable fill from end to end with no intermediate pour points.

C. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and to control pressure.

D. Temporarily plug pipes which are to remain in operation during pouring/pumping to keep lines free of flowable fill.

E. Pump flowable fill through bulkheads or use other suitable construction methods to contain flowable fill in lines to be abandoned. These pipes will act as injection points or vents for placement of flowable fill.

F. Place flowable fill under pressure flow conditions into properly vented open system until flowable fill emerges from vent pipes. Pump flowable fill with sufficient pressure to overcome friction and to fill pipe from downstream end, to discharge at upstream end.

G. Inject flowable fill through replaced ballast using grouting equipment and series of grout pipes discharging at bottom of placement, allowing fill to rise through ballast effectively filling all voids. Alternatively, sequentially place individual pieces of ballast at same time as flowable fill is placed. Do not fill with ballast more than 50 percent of volume at any level, to prevent nesting and void formation.

H. Remediate placement of flowable fill which does not fill voids in pipe, or where voids develop due to excessive shrinkage or bleeding of fill, by using pressure grouting either from inside pipe or from surface.

I. Plug each end of pipe being abandoned.

3.05 FORCE MAIN ABANDONMENT

A. Clean inside surface of force main at least 12 inches from ends to achieve firm bond and

seal grout plug or manufactured plug to pipe surface. Similarly, clean and prepare exterior pipe surface if manufactured cap is to be used.

B. When using grout plug, place temporary plug or bulkhead approximately 12 inches inside pipe. Fill pipe end completely with dry-pack grout mixture.

C. When using manufactured plug or cap, install fitting as recommended by manufacturer's instructions, to form water tight seal.

D. Backfill to surface, above pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in compliance with Section 31 23 33.

E. Collect and dispose of excess flowable fill material off site.

3.06 ABANDONING MANHOLES

A. Contractor shall remove top slabs and first section of manholes to be abandoned and any other specified pumps or accessories prior to abandoning.

B. Contractor shall abandon manholes after piping has been grouted and abandoned.

C. Manholes shall be filled with base course material and compacted in 1-foot lifts.

3.07 PROTECTION OF PERSONS AND PROPERTY

A. Provide safe working conditions as required by OSHA and applicable state and local laws for employees throughout demolition and removal operations. Observe safety requirements for work below grade.

B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to work.

END OF SECTION 33 31 00.10

SECTION 33 31 13
SITE SANITARY SEWERAGE PIPING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Drawings and Special Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Section 40 27 00 – Process Piping

1.02 SUMMARY

A. Furnish sewer pipe and fittings as specified in the Contract and this section. Pipe strength classifications are shown on the plans, listed in the Contract Documents or specified herein.

1.03 CERTIFICATION BY MANUFACTURER:

A. Furnish a manufacturer's certification for all pipe and fittings, certifying that the pipe and fittings meet the contract requirements.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE:

A. GENERAL

1. Furnish PVC pipe produced by a continuous extrusion process, employing a prime grade of unplasticized polyvinyl chloride. Assure the grade used is highly resistant to hydrogen sulfide, sulfuric acid, gasoline, oil, detergents and other chemicals found in sewage and industrial wastes. Assure the material meets "Rigid Polyvinyl Chloride Compounds", ASTM Designation D-1784 requirements. Assure the pipe has self-extinguishing flammability characteristics.

B. GRAVITY SEWER PIPE

1. Furnish gravity sewer pipe meeting one of the following requirements:

a. ASTM D-3034, "Standard Specifications for Polyvinyl Chloride Sewer Pipe and Fittings", with an SDR of 35 4"-15" (10 cm - 38 cm).

b. ASTM F679, T-1 wall thickness (SDR35), "Standard Specifications for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings" 18"-27" (46 cm - 69 cm).

2. Furnish pipe having nominal 12.5 feet (3.8 meters) laying lengths, except shorter lengths may be used adjacent to manholes, or other appurtenances. Assure each pipe section is marked, as a minimum, with size, SDR, "Sewer Pipe" and Code Number.

C. PRESSURE SEWER PIPE

1. Furnish pressure sewer pipe meeting ASTM D2241, “Standard Specification for Polyvinyl Chloride Plastic Pipe (SDR-PR), with an SDR of 26 and a pressure rating of 160.
2. Use a nominal laying length of 20 feet (6.1 meters), except shorter lengths may be used adjacent to bends or other appurtenances. Assure each pipe length is marked, as a minimum, with size, SDR or pressure rating or both, ASTM designation and manufacturer’s name and code.

D. PIPE JOINTING

1. Furnish each pipe length with a bell designed to provide a watertight joint when jointing the bell and spigot with a rubber ring.
2. Make a rubber gasket joint for PVC pipe and fittings using a rubber gasket compressed between the outer surface of the spigot and the inner surface of the bell. Assure the joint is completely sealed by the gasket so that the assembly remains watertight under all service conditions, including expansion, contraction, settlement and pipe deformation. Follow the manufacturer’s recommendations when assembling the rubber ring joint.

E. FITTINGS

1. Assure all fittings for connecting all gravity and/or pressure piping and service lines are of the same material, construction and joint design as specified.

2.02 DUCTILE IRON PIPE:

A. All Ductile Iron pipe and fittings utilized for sanitary sewer or in-plant process piping shall be in compliance with Section 40 27 00 – Process Piping.

2.03 CONCRETE PIPE

A. GENERAL

1. Furnish concrete sewer pipe meeting ASTM Specifications C14, C76 or C655, latest revision, except as noted herein. Assure cement used to make concrete pipe is Type II A Modified, Type V, or other approved cement containing less than 5 percent Tricalcium Aluminate. The pipe strength classifications for C14, C76 or C655 specification pipe is listed in the plans or Contract Documents.
2. The maximum absorption allowed is 7 percent. For pipe sizes smaller than 12 inches (30 cm) in diameter, assure the cement proportion in the concrete mixture is not less than 6-1/2, U.S. standard 94 pound bags per cubic yard (362 kg/m3) of concrete.
3. Furnish pipe meeting the referenced ASTM specifications on permissible variations in pipe dimensions. Assure the barrel thickness is uniform to providing a constant flow area without projections across joints.

B. FITTINGS

1. Assure all fittings for connecting all gravity and/or pressure piping and service lines are of the same material, construction and joint design as specified.

C. JOINTING MATERIALS

1. Make joints for concrete pipe using flexible, watertight, rubber-type gaskets meeting to ASTM C443, with a O-ring gasket confined in the pipe tongue groove.

D. PIPE JOINTING

1. Thoroughly clean the spigot and bell ends of the pipe before joint assembly. Follow the pipe and joint manufacturer's recommendations for pipe jointing. Check the position of the rubber gaskets and pipe assembly using a feeler gauge before backfilling the trench. Visually inspect and gauge pipe and joints from inside the pipe where pipe size permits to assure proper gasket position and joint gap tolerances.

E. MATERIALS TESTING

1. Have the pipe supplier furnish the Engineer with certified test results from an independent testing laboratory on the following: (a) crushing strength (3-edge bearing method), (b) absorption, and (c) hydrostatic test. Furnish test results for each pipe as specified in ASTM C14, C76 or C655, or a minimum 2 percent of the number of pipe supplied, whichever is greater. Cost of these tests to be borne by the pipe supplier.

2.04 HIGH DENSITY POLYETHYLENE (HDPE) PIPE:

A. PIPE

1. Furnish HDPE pipe meeting ASTM D3350, having a cell classification of PE 34-5434C. Assure dimensions and workmanship meet ASTM F714 requirements.

B. FITTINGS

1. Use wye or tee fittings for connecting service lines of the same material construction, and joint design as the main sewer pipe.

C. PIPE JOINTING

1. Heat fusion weld all field joints to meet the manufacturer's recommendations.

D. OTHER PIPE MATERIALS:

1. Other pipe materials may be specified at the discretion of the Engineer and Owner.

2.05 MANHOLES:

A. Construct manholes from precast concrete sections having frames, covers, and steps meeting applicable Standard Drawings.

B. Precast Concrete Sections

1. Furnish manholes meeting ASTM C478; “Precast Reinforced Concrete Manhole Sections”, specifically including mandatory rejection requirements.

C. Steps

1. Furnish non-corrosive steps, 12-inches in width, of ½” steel rod encased with polypropylene. Assure steps withstand 400 lb. vertical loads and 1,000 lb. pull-out resistance.

D. Frames and covers

1. For paved areas furnish D & L Foundry A- 1178 ring and cover, or East Jordan Iron Works 3771/3772 series ring and cover, or approved equal. Assure that all covers have two pick holes, 1” minimum, 1 ¼” maximum diameter. Cover lettering shall be “Sanitary Sewer”. For gravel areas furnish D&L Foundry A-1172 with 1” cover or East Jordan Iron Works 3772 series cover, O-ring frame or approved equal, with recessed pick holes.

E. Lift Station Building Wet-Well Covers

1. Wet-well covers shall be Neenah Foundry R-6660 gasketed lid with bolts. Lids shall fit the existing frames and shall be airtight to prevent gasses from entering the interior building. The Contractor shall verify the opening sizes and bolt hole locations prior to ordering the new covers. Covers that do not fit and provide an airtight seal shall be replace at no additional cost to the Owner.

F. Concrete Base

1. Furnish precast concrete bases or field poured on undisturbed earth. Use concrete meeting Section 03 30 00 – CAST IN PLACE CONCRETE

PART 3 - EXECUTION

3.01 PIPE AND SERVICE LINE INSTALLATION

A. Excavation and Backfill

1. Perform pipeline excavation and backfill meeting the applicable requirements of Section 31 23 33.

B. Responsibility for Materials

1. Be responsible for all material furnished. Replace all material found defective in manufacture or damaged in handling after delivery. This includes furnishing all material and labor required for the replacement of installed material discovered defective before final acceptance of the work or during the guarantee period.

2. Be responsible for the safe storage of material intended for the work until it has been incorporated in the completed project.

C. Handling of Pipe

1. Deliver and distribute all pipe to the site. Load and unload pipe, fittings and

accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop any materials. Do not roll or skid pipe handled on skidways against pipe already on the ground.

2. In distributing the material at the site of the work, unload each piece opposite or near the place where it is to be laid in the trench. Keep the interior of all pipe and other accessories free from dirt and foreign matter at all times.
3. Handle pipe to prevent damaging coating or lining. If any part of the coating or lining is damaged, make all repairs in a manner satisfactory to the Engineer.
4. If the pipe is UV baked/damaged the Contractor shall replace pipe at no additional cost to the Owner.

D. Laying Pipe

1. Lay and maintain all pipe to the specified lines and grades with fittings, tees and manholes at the required locations. Establish line and grade using batter boards and string line, laser equipment or other approved methods. When batter boards and string line are used, use a minimum of three batter boards at all times.
2. Install wye or tee fittings in the mainline sewer for service line connections. Furnish wye or tee fittings of the same material, design and specifications as the sewer main pipe. Joint service pipe to tee branches or main line pipe other than PVC using special joint adapters manufactured specifically for jointing the two types of pipe.
3. Use tools and equipment, satisfactory to the Engineer, for the safe and convenient prosecution of the work. Carefully lower all pipe and fittings into the trench to prevent damage to pipe materials and protective coatings and linings. Do not drop or dump any materials into the trench.
4. Take every precaution to prevent foreign material from entering the pipe while it is being installed. At times when pipe laying is not in progress, close the open ends of pipe using a plug or other means approved by the Engineer. Clean and remove all sand, gravel, concrete and cement grout that has entered the lines during construction

E. Tolerances

1. Install the pipe within 1/2-inch (13 mm) of the specified alignment and within 1/4-inch (6 mm) of the specified grade.

3.02 MANHOLES

A. Construction

1. Construct manholes to the specified dimensions. Make invert channels smooth and semi-circular in shape conforming to the inside of the adjacent sewer section. Make changes in flow direction with a smooth curve of as large a radius as the manhole size will permit. Make changes in channel grade and size gradually and evenly. The invert channels may be formed directly in the manhole base concrete or by laying half-pipe in the concrete. Make the floor of the manhole outside the channel smooth and slope toward the channel at one inch per foot (8 cm per meter).

2. Joint all connections between manhole walls and base and between wall sections adjusting rings and frame making the manhole watertight. For all horizontal joints located below the established high groundwater elevation, install a preformed rubber gasket joint. The established high groundwater level is shown on the plans, noted in the Special Provisions, or in the Geotechnical Report. For all sewer pipe to manhole joints, use gasketed, flexible, watertight connections that will accommodate differential settlement. Acceptable options for these connections to the manhole are as follows:

    a. Adjacent Joints: Bell and spigot pipe joints with rubber sealing rings located within 12 inches (30 cm) of the manhole wall.

    b. Compression-Type Flexible Connector: A resilient, flexible connection, cast into manhole wall, providing 10 degrees deflection.

    c. Boot-Type Flexible Connector: A flexible, watertight connection consisting of a rubber gasket or boot, metal expansion ring and a metal take-up clamp. Assure the expansion ring holds the gasket in the manhole wall, with the take-up clamp holding the gasket to the pipe.

    d. Options (b) and (c) are limited to precast manhole base inverts and other installations where the flexibility of the connection is not compromised.

    e. Construct manholes meeting ASTM C478, and the rejection criteria stated therein.

    f. Keep manhole construction within one manhole distant behind sewer pipeline construction.

3. Install adjusting rings on each manhole to bring the manhole top elevation to match the existing or specified ground elevations. Use manhole rings with a 2-inch minimum (5 cm) and 12-inch (30 cm) maximum height. Furnish adjusting rings reinforced with the same percentage of steel as the riser and top.

3.03 SANITARY SEWER SERVICE LINES

A. Construct service lines meeting MPW Standard Drawing 02730-2. Install the service line to the property line. Plug the end of the service line with a stopper and gasket, using a gasket of the same type used for pipe jointing. Do not grout the plugs.

B. Mark the sanitary sewer and storm drain service line ends at the property line using a steel fence post 5 feet (1.5 m) long, buried at least 2 feet (0.6 m). Place a 2" X 2" (5cm X 5 cm) wood marker extending from the pipe invert to ground line. Wire the 2" X 2" (5cm X 5 cm) marker to the steel fence post. Where applicable, mark the concrete curb to identify the service locations. Paint sanitary sewer service markers green and storm drain service markers gray.

3.04 TESTS

A. Make all tests after backfill is completed, but before any surface restoration or street surfacing. Be responsible for finding and repairing all breaks and leaks revealed by the

tests. Additionally, perform all tests in the presence of the Engineer, resident inspector, or the Owner's other designated representative.

B. Light Test (Visual)

1. After the trench has been backfilled and compacted as specified in Section 02221, perform a light test between manholes to check alignment and grade for pipe displacement. Excluding curved alignments shown on the plans, the completed pipeline is to permit a true circle of light to be visible from one manhole to the next. If alignment or grade is not that specified and displacement of pipe is found, remedy all defects.

C. Leakage Test

1. New sewer line will not be finally accepted until leakage tests are made assuring the Engineer that pipe laying and jointing are satisfactory.

D. Water Test

1. Where groundwater is at least 2 feet (0.6 m) above the sewer line, make tests by sealing off the section of lines between manholes and measuring the actual flow by collecting or pumping the discharge into barrels or other approved methods. Continue tests at a minimum of 4 hours for each section tested. Allow time to soak lines and manholes in advance of performing tests.

2. When groundwater is not 2 feet (0.6 I11) above the pipe, test as follows: On flat slopes where the depth over the centerline of the pipe in the lower manhole of the section being tested will be not more than 10 feet (3 m), fill the upper manhole to 2 feet (0.6 m) over the top of the pipe or 2 feet (0.6 m) above the groundwater elevation (whichever is higher), and block the lower manhole. When the above conditions cannot be met, the Engineer may order testing the line in sections between manholes. Measure the leakage by checking the water level drop in the manhole over a 4 hour period.

3. The allowable infiltration or exfiltration, including manholes, cannot exceed 200 gallons per day per mile of sewer per inch of pipe diameter (185 liters per day per kilometer of sewer per centimeter of pipe diameter). This does not exclude obvious and concentrated leaks and physical defects, such as open joints, pinched gaskets, cracked barrels or bells, etc. Make repairs on concentrated leaks, and as required to reduce infiltration or exfiltration leakage below the specified rate.

E. Air Test (Alternative)

1. As an alternate method to water testing, the Contractor may utilize low pressure air to test the sewer mains. Use the test procedure described below: Plug both ends of the pipe under test with airtight plugs and brace to prevent slippage and blowout. Furnish one plug with an inlet tap or other provision for connecting an air hose.

2. Equip the air supply hose, connected between the air compressor and the plug, with a throttling valve, an air bleed valve and a high pressure shutoff valve for control. Equip the low pressure side of the throttling valve with a tee for a monitoring

pressure gauge, protected by a gauge cock. This cock is kept closed except when the pressure loss is being timed.

3. If the pipeline is submerged under groundwater, the back pressure, caused by the water head, is measured and added to the standard test pressures to compensate for the groundwater effect on the air test.
4. Apply air slowly to the pipeline until the pressure reaches 4.0 psig. Throttle the air supply to maintain the internal pressure between 4.0 and psig for at least 2 minutes. During this time check the plugs with soap solution to detect any plug leakage.
5. When the pressure reaches exactly 3.5 psig, disconnect the air supply, start a stop watch and record the time for the pressure to drop to 2.5 psig. The minimum time allowed for the pressure drop is computed on an air loss rate of 3.5 cfm or an air loss rate of 0.0030 cubic feet per minute (cfrn) per square foot of inner pipe surface area under test, whichever rate yields the least time for the pressure drop. Should the time of the pressure drop between 3.5 and 2.5 psig be less than the allowable specified time, make the necessary leakage repairs and repeat the air test.
6. MPW Standard Drawing 02730-1 provides a nomograph which may be used to compute testing times for air testing. The nomograph computes results based upon English (U.S. Customary) units.
7. For single pipe size test sections, the length limits for minimum test times obtained from MPW Standard Drawing No.02730-1 entitled "Nomograph for Air Testing Gravity Sewer Mains" are contained in the following table.

TABLE 3.1

LENGTH LIMIT FOR MINIMUM TEST TIMES

Pipe Diameter, Inches	Test Section Length, Foot	
	Minimum	Maximum
4	642	1124
6	429	751
8	322	564
10	257	450
12	215	376
15	172	300
18	43	1250
21	123	215
24	107	188

8. For test sections that are shorter than the minimum lengths, new test times must be calculated. This is done by multiplying the test time from the nomograph by the actual length of the test section (in feet) and then dividing the resultant product by the minimum test section length from the preceding table
9. For test sections exceeding the maximum lengths, either shorten the test section to an

allowable length or use the water test.

F. Number of Tests

1. Perform the number of leakage tests directed by the Engineer to assure that materials and workmanship are acceptable. Repair defective joints using only approved methods. Replace pipe having cracked or broken barrels. Do not exceed 800 feet of sewer line per test unless otherwise approved.

G. T.V. Inspection

1. All sewer mains shall be inspected using a television camera before final acceptance. A sewer line is deficient and unacceptable if (1) the alignment is outside the specified limits, (2) water ponds in any section are equal to or greater than 2 times the grade tolerance specified herein under Section 02730.3.E.1, or (3) the pipe has visible defects such as open joints, pinched gaskets, cracked barrels or bell, or similar defects.

2. Pay all costs incurred in any television inspection performed solely for Contractor benefit.

3. Record all television inspections in a format acceptable to the Owner. Pull the camera through the sewer at 30 feet per minute (9 meters per minute maximum). If the camera is pulled by attaching to the hose of a hydraulic sewer cleaner, assure the hose is not active during the pulling process.

H. Deflection Testing

1. The Engineer may require deflection testing of all or any portion of a flexible pipe installation to assure the construction quality. Flexible pipe is pipe that will deflect at least 2 percent without any sign of structural distress.

2. Conduct deflection tests, when performed on PVC pipe, meeting ASTM D3034 and satisfy either of the following deflection limitations:

TABLE 3.2

DEFLECTION TESTING LIMITATIONS

Minimum Period Between Trench Backfilling & Testing	Minimum Mandrel Diameter as a Percent of Inside Pipe Diameter
7 Days	95.0
30 Days	92.5

3. Mandrels must have at least nine arms. Perform the mandrel test without mechanical pulling devices.

I. Material and Equipment for Testing

1. Furnish all labor, equipment and materials (including water) necessary for performing the sewer line tests at Contractor expense.

3.05 WATER AND SEWER MAIN SEPARATION

A. Horizontal and vertical separation between water and sewer mains is dictated by Montana Department of Environmental Quality.

3.06 MANHOLE LEAKAGE TESTING

A. General:

1. Conduct tests in the presence of and to the complete satisfaction of the Engineer.
2. Should a manhole not satisfactorily pass testing, discontinue manhole construction in the Project until such manhole does test satisfactorily.
3. The contractor may choose the type of manhole testing to be done on this project if groundwater is below the bottom of the manhole. Both exfiltration testing and vacuum testing will be acceptable.
4. Provide tools, materials (including water), equipment and instruments necessary to conduct manhole testing specified herein.
    a. Vacuum Testing Equipment:
        i. Use vacuum apparatus equipped with necessary piping, control valves, and gauges to control air removal rate from manhole and to monitor vacuum.
        ii. Provide an extra vacuum gauge of known accuracy to frequently check test equipment and apparatus.
        iii. Vacuum testing equipment and associated testing apparatus are subject to approval by the Engineer.
        iv. Provide seal plate with vacuum piping connections.
    b. Prior to testing, clean manholes thoroughly and seal openings both to the complete satisfaction for the Engineer. Seal openings using properly sized plugs.
    c. Perform testing with frames installed. Include the joint between the manhole and manhole frame in the test.
    d. The Contractor may elect to make a test for his/her own purposes prior to backfilling. However, only tests on installed (backfilling complete) manholes will be accepted by the Engineer.

B. Vacuum Test Procedure: Test in accordance with ASTM C1244 and the following test procedures:

1. Perform vacuum testing in accordance with the testing equipment manufacturer’s written instructions.
2. Create a vacuum of 10 inches of mercury and close the valves.
3. Consider manhole acceptable when vacuum does not drop below 9 inches of mercury for the following manhole sizes and times:
    a. 4-foot diameter – 60 seconds

b. 5-foot diameter – 75 seconds

c. 6-foot diameter – 90 seconds

d. 7-foot diameter – 105 seconds

e. 8-foot diameter – 120 seconds

C. Exfiltration Test Procedure: Groundwater must be below the bottom of the manhole to perform this test. Test in accordance with ASTM C969 and the following test procedures:

1. Completely fill manhole to top of the frame with water.
2. Allow water-filled manhole to stand a minimum of 4 hours prior to testing to allow absorbing in materials.
3. At commencement of test, fill manhole to top lip of manhole frame.
4. During a consecutive 4-hour long period, keep an accurate record of the amount of water to be added because of exfiltration. (How much water is added to maintain the water level at the top of the frame).
5. Consider the manhole acceptable when exfiltration rate does not exceed the following rate:

(0.1 gal) x (diameter in feet) x (head in feet) x (hours)

D. Repair and Retest. Determine source of leaks in manholes failing acceptable limits.

1. Repair or replace defective materials and workmanship, as is the case, before conducting such additional Manhole Acceptance Tests and such subsequent repairs and retesting as required until manholes meet the test requirements.
2. Make repairs, replacements and retests at no additional expense to the Owner.

END OF SECTION 33 31 13

SECTION 33 31 19
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Piping Materials and Fittings
2. Polyethylene Encasement
3. Valves
4. Reaction Backing (Thrust Blocking)
5. Bedding and Backfilling
6. Yard Hydrants
7. Fire Hydrants
8. Appurtenances
9. Pipe Installation
10. Pipe Thrust Restraint
11. Testing Gravity Lines
12. Testing Pressure Mains

B. Related Sections include, but are not limited to:

1. Section 00 95 10 – Special Provisions.
2. Section 01 31 00 – Coordination and Meetings.
3. Section 01 33 00 – Submittals.
4. Section 01 40 00 – Quality Control.
5. Section 31 05 13 – Soils for Earthwork.
6. Section 31 23 33 – Trenching and Backfilling.
7. Section 32 05 16 – Aggregates for Exterior Improvements.
8. Section 33 01 10.58– Disinfection of Utility Piping Systems.
9. Section 40 27 00 – Process Piping General

1.02 REFERENCES

A. Reference Standards include, but are not limited to:

1. ASTM A536 – Ductile Iron Castings.
2. ASTM B88 – Seamless Copper Water Pipe.
3. ASTM D3139 – Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
4. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Gray-Iron and Ductile-Iron Pipe and Fittings for Water.
5. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids.
6. ANSI/AWWA C110/A21.10 - Gray-Iron and Ductile-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.

7. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Gray-Iron and Ductile-Iron Pressure Pipe and Fittings.
8. ANSI/AWWA C150/A21.50 - American National Standard for Thickness Design of Ductile-Iron Pipe.
9. ANSI/AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
10. ANSI/AWWA C153/A21.53 - Ductile-Iron Compact Fittings, 3-Inch through 12-Inch, for Water and Other Liquids.
11. AWWA C509 - Resilient-Seated Gate Valves, 3 through 12 NPS, for Water and Sewage Systems.
12. AWWA C550 - Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
13. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
14. AWWA C605 - Underground Installation of PVC Pressure Pipe and Fittings.
15. AWWA C800 - Standard for Underground Service Line, Valves, and Fittings.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 12 In., for Water.
17. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. through 48 In., for Water Transmission and Distribution.
18. ASTM D1784 - Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.
19. ASTM D1785 - Poly (Vinyl Chloride) Plastic Pipe, Schedules 40, 80, and 120.
20. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
21. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe fittings, Schedule 80.
22. ASTM F477 - Elastometric Seals (Gaskets) for Joining Plastic Pipe
23. NSF Standard No. 14, 60, and 61 - National Sanitation Foundation.
24. WW-T-779c - Federal Specifications

1.03 SUBMITTALS

A. Submit Shop Drawings per Section 01 33 00 for all pipe and fittings indicating: Name of Manufacturer, Materials, Standard Dimensions, References, Joint Data, maximum loadings, and thrust restraints.

B. Provide a list of materials and corresponding suppliers.

C. Submit Affidavit of Compliance certifying that materials furnished have been tested and are in compliance with specification requirements.

1. Submit design calculations for structural design of pipe thickness where pipe class or

thickness is not specifically called out.

D. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

E. Manufacturer’s Instructions: For valves, hydrants, and specialties, furnish in accordance with Sections 01 61 00 and 01 77 00 manufacturer’s printed instruction for delivery, handling, storage, assembly, installation, adjustment, special tool requirements, and maintenance requirements.

F. In accordance with Section 01 77 00, provide records of measured depths of water mains, service leads, valves, connections, transition couplings, adapters, thrust blocking; measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements; measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work; field changes of dimension and detail.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with Section 01 45 00.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.05 FIELD MEASUREMENTS

A. The Drawings indicate required pipe sizes and the general arrangement for major piping. Locations shall be verified in the field by the Contractor. Valves, fittings, and appurtenances shall be of such dimensions to allow for the installation of this piping substantially as shown on the Drawings. In the event it should become necessary to change the location of any of the work due to interference with other work, Contractor shall consult with the Engineer prior to making any changes and all such changes shall be made at no additional cost to the Owner.

B. Prior to roughing in any facilities or installation of piping and equipment, consult all related drawings including general, mechanical, electrical, etc., and inform self of materials, locations of structures, pipes, duct banks, electrical conduits, etc., which may impact the installation.

C. Discrepancies discovered before or after work has started, shall be brought to the attention of the Engineer immediately, and the Engineer reserves the right to require minor changes in the work to eliminate such discrepancies.

D. Pipe connections to equipment shall be subject to approval of Engineer and coordinated to meet the manufacturer’s recommendations and requirements.

E. No work that connects directly to equipment shall be installed before complete shop drawings of said equipment have been reviewed and approved by the Engineer.

1.06 PROJECT CONDITIONS

A. Verify dimensions of and between existing structures and locations of existing piping and equipment for the proper installation of all new piping and equipment.

B. Contractor shall be responsible for verification of location of all existing piping and

structures. Potholing and or excavation to expose existing piping, conduits, etc. may be required prior to installation of new piping or connection to existing piping. Adjustments to the locations of new piping may be required due to locations of existing piping and sequencing of construction that will be required. Adjustments required shall be at no additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivered materials shall be stockpiled and stored at locations approved by the Owner until required for installation. Materials shall be transported, delivered, stored, and handled in accordance with Manufacturer's instructions and the requirements of Section 01 61 00.

B. Contractor shall inspect materials upon delivery for loss or damage in transit. Contractor shall be responsible for the replacement of damaged materials; damaged materials shall be removed from the Site.

1.08 REGULATORY REQUIREMENTS

A. All products that may come into contact with water intended for use in a public water system shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each product.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE (DIP) AND FITTINGS

A. The pipe and fittings furnished shall be of the Ductile Iron type as specified for each particular use or installation and shall be minimum Pressure Class 350 for pipe 3-12 inches and minimum Pressure Class 250 for pipe 14 inches and greater, unless otherwise noted.

B. Materials:

1. Ductile iron pipe shall conform to the requirements of AWWA C151/ANSI A21.51 with mechanical joints.

2. Mechanical or push-on joints shall conform to the requirements of AWWA C111/ANSI A21.11.

3. The weight, class, or nominal thickness and casing period shall be shown on each pipe. The manufacturer's mark, year produced, and letters "DI" or "Ductile" shall be cast or stamped on the pipe.

4. Mechanical joint fittings shall conform to the requirements of AWWA C110/ANSI A21.10 rated at 250 psi or 350 psi for sizes larger than 16 inches in diameter, and AWWA C110/ANSI A21.10 or AWWA C153/ANSI 21.53 rated at 350 psi for sizes up to and including 16 inches. No plain end fittings shall be allowed.

5. Rubber gaskets shall conform to the requirements of AWWA C111. Gaskets used for

air piping shall be EPDM.

6. All pipe joints and fittings shall have conductive gaskets with copper inserts or copper strap welded to the pipe and connected with silicone bronze bolt. The conductors shall be rated at 600 amps sustained current.
7. All ductile iron pipe and fittings shall be lined with cement mortar in accordance with AWWA C104/ANSI A21.4, unless otherwise noted. Ductile iron pipe and fittings used for air piping shall not be cement lined.
8. All ductile iron pipe and fittings shall be polyethylene encased in accordance with AWWA C105.

C. Air line piping shall not be lined with cement.

D. All exterior surfaces of pipe and fittings shall have a tar or bituminous seal coating conforming to AWWA C151. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection of the materials.

E. Retainer glands for restrained joints shall be American, US Pipe, or EBAA Iron, Inc. Mega Lug type, ductile iron, and be designed to meet or exceed the pressure classification of the corresponding pipe. Restraint glands for mechanical joint pipe shall be EBAA Iron, Inc. Megalug, Series 1100, or equal. Push joint pipe shall be restrained using restraint harnesses EBAA Iron, Inc. Megalug, Series 1700, or equal. Joint restraint systems shall be rated for at a minimum the design pressure of the pipe with a 2 to 1 safety factor.

F. Restrained joint pipe may be used in lieu of joint restraint systems for push on and mechanical joint pipe. Restrained joint pipe shall be US Pipe TR Flex or American Flex Ring pipe, or equal.

G. Nuts, bolts, and tie rod restraints shall be 304 stainless steel. Tee bolts for mechanical joints and fittings shall be “Cor-Blue” by NSS industries, or equal.

H. See Section 33 05 26 for Utility Identification and tracer wire requirements.

2.02 POLYVINYL CHLORIDE (PVC) PIPE

A. The PVC pipe and fittings furnished shall be of the type as specified below for each particular use or type of installation.

B. Water Service Piping (1.5 to 2 inches diameter):

1. As specified in the piping schedule presented in the Construction Drawings.
2. Pipe, fittings, and valves shall be manufactured from a PVC compound which meets the requirements of Type I, Grade 1 PVC in accordance with ASTM D1784. Compound from which pipe is produced shall have a design stress rating of 2,000 psi at 23 degrees C, listed by the PPI.
3. Pipe, fittings, and valves shall be Schedule 80.
4. Pipe, fittings, and valves shall be installed in compliance with manufacturer’s recommendations and in accordance with ASTM D2274.

2.03 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. All high density polyethylene pipe shall be DR 11, unless specified otherwise, conforming to ANSI D-2239.

B. All HDPE pipe to have standard ductile iron pipe size (DIPS) dimensions.

C. All pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults. The physical appearance of the pipe having deformities such as concentrated ridges, discoloration, excessive spot roughness, pitting, varying wall thickness, etc., shall constitute sufficient basis for rejection.

D. Ductile Iron Fittings:

1. All ductile iron fittings connecting to polyethylene pipe are required to include stainless steel sleeve inserts inside the pipe and PE electrofusion MJ adapters as manufactured by Central Plastics Company or approved equivalent.

2. PE electrofusion fittings may be substituted for ductile iron fittings at no additional cost to Owner. Fitting and piping shall be heat fused in accordance with ASTM D2657. Butt fusion fittings shall conform to ASTM D3261.

3. Push-on or mechanical rubber gasket joints conforming to the compression gasket ring requirements of ANSI/AWWA C111/A21/11 and ASTM D3139, and as shown on Drawings.

4. Provide stainless steel nuts, bolts, and glands.

2.04 GAS LINE

A. Gas Line provided and installed by others, contact Northwest Energy prior to earthwork activities.

2.05 POLYETHYLENE ENCASEMENT

A. Conform to and install per ANSI/AWWA C105/A21.5.

B. Install on all underground metallic items, including: ductile iron pipe, ductile iron fittings, metal body valves, other metal pipe and fittings, fire hydrants, stainless steel couplings, transition couplings, and service and testing tapping saddles.

2.06 REACTION BACKING (THRUST BLOCKS)

A. Conform to details shown on Drawings for bends, tees, fire hydrants, dead end plug, and service tap connections.

B. 3,000 psi concrete for pipe, fittings, and plugs unless specifically shown otherwise on Drawings.

2.07 BEDDING AND BACKFILLING

A. Materials: As specified in Section 31 23 33 for backfill and pipe bedding.

B. Aggregate Bedding: Fill Type A1 for over-excavation and Fill Type A5 for standard bedding as shown on the Construction Drawings and specified in Section 32 05 16.

C. Material: Fill Type S1 or S2 as specified in Section 31 05 13.

2.08 VALVES

A. Resilient Wedge Gate Valves: 4-inch to 12-inch.

1. Minimum working pressure of 200 psi for 4-inch to 12-inch valves.
2. Valve body and rubber-encapsulated wedge constructed of ductile iron or cast iron.
3. Resilient seat gate, bubble-tight closure design.
4. Meet or exceed the ANSI/AWWA C515 standards.
5. Bronze stem and stem nut.
6. Fusion Bonded Epoxy-coated interior and exterior in accordance with AWWA C550.
7. Equipped with non-rising stem with 2-inch square operating nut, open left (counter clockwise) rotation.
8. Provide adjustable valve box, riser, and cover. Provide stem extensions for all actuators. Extension length will vary with the depth of bury for each valve and shall extend to within one (1) foot of top of valve box. Provide all necessary appurtenances for complete operation of valve.
9. Provide polyethylene encasement conforming to ANSI/AWWA C105/A21.5 for buried valves.
10. Connections: Mechanical joint.
11. Provide gaskets and stainless steel nuts and bolts.
12. Markings shall be cast on the bonnet or body of each valve and shall show the manufacturer's name or mark, year valve casting was made, size of valve, the letters "C515", and the designation working water pressure.
13. Manufacturer shall furnish an affidavit stating that the valve and all materials conform to the applicable AWWA requirements and all tests specified under the respective standard have been performed and have been met. Valves shall be NSF 61 certified.
14. Approved manufacturers:
    a. American Flow Control
    b. Mueller Company
    c. Waterous Valve Company
    d. M & H Valve Company
    e. Clow Valve Company
    f. Or approved equivalent.

B. Resilient Wedge Gate Valves, size 14" and Larger.

1. Standard: AWWA C-515, AWWA C-509, Non-rising stem.
2. Minimum rated working pressure: 250 psig for 18” and 150 psig for 30”.
3. Finish: Interior and exterior fusion bonded epoxy coating meeting or exceeding requirements of AWWA C550 and complying with NSF-61.
4. Bevel Gear 6:1 Operator EXEECO IB8, or Approved Equivalent.
5. Connections: Mechanical joint.
6. Materials:
    a. Valve Body, Stuffing Box, and Bonnet: Ductile iron, ASTM A536.
    b. O-rings: Rubber.
    c. Lower Thrust Washer: Derlin.
    d. Upper Thrust Washer, Nuts, Bolts, and Flat Washer: Stainless steel.
    e. Stuffing Box Gasket: Rubber o-ring.
    f. Throat Flange Gasket: Rubber.
    g. Stem and Wedge Nut: Manganese bronze.
    h. Resilient Wedge: Ductile iron, ASTM A536 coated with rubber. The wedge shall symmetrically seal in both directions.
7. Warranty: 10 years.
8. Counterclockwise Open EPDM.
9. Approved Manufacturer:
    a. American Flow Control Series 2500.
    b. US Pipe and Foundry Company.
    c. Or approved equivalent.

2.09 NON-FREEZE YARD HYDRANTS

A. Ground hydrants shall be self-draining, non-freezing, ductile iron construction with ⅜" steel operating rod and 90° lift handle. Inlet connection shall be ¾" FTP and outlet nozzle shall be ¾" brass GHT.

B. Ground hydrants shall have 1" galvanized steel casing pipe. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating hydrant.

C. Bury depth shall be 6.0 feet minimum.

D. Hydrants shall be set in ⅔ cubic feet of crushed gravel to allow for proper drainage of the hydrant, *gravel shall be encased in filter fabric* to prevent fouling of drain stone. Recommendation of the AWWA should be followed for installation of hydrants.

E. Ground hydrants shall be Woodford Model R34 Freezeless Yard Hydrant or approved

equal.

2.10 FIRE HYDRANTS *(if applicable)*

A. Fire hydrants shall be 5¼" main valve opening;

B. Three way (two hose nozzles, one pumper nozzle) with large radius, full flow openings – field replaceable;

C. Must be approved to UL 246, FM 1510, ANSI/AWWA C502 Standards;

D. Post type, dry barrel design;

E. Dry top design with O-ring sealed oil reservoir;

F. Compression-type main valve, closes with pressure for positive seal, made of rubber and reversible;

G. Contoured shoe designed for full flow

H. Dual bronze drain valve for effective barrel drainage;

I. 10-year warranty on materials and workmanship;

J. Fire hydrants shall be Mueller® Super Centurion 250™ 3-way hydrant or approved equal.

2.11 VALVE BOXES

A. Valve boxes shall be three piece cast iron with a round base, Mueller H-10357 or Tyler Union.

B. The top of the valve boxes shall be 5 ¼ inches in diameter.

C. Valve box height shall be suitable for the burial depth of the valve and shall have sufficient length to permit at least 6-inches of adjustment above and below grade when the valve is laid to the specified depth. Adjustment shall be screw type.

D. Covers shall have the word “Potable Water” or “Non-Potable Water” or “Sewer” cast on top.

E. All buried valves shall have a full operator extension.

2.12 APPURTENANCES

A. Bolts: Stainless steel underground bolts, including all bolts on fittings, valves, and transition couplers. Tee bolts for mechanical joints and fittings shall be “Cor-Blue” by NSS industries, or equal.

B. Tie Bolts: Cretex Gasketed Pipe Joint Ties, or approved equivalent.

C. Service and Tapping Saddles:

1. All stainless steel tapped outlet, band clamps, nuts, bolts, and washers.

2. Heavy gauge type 304 stainless steel shell construction, passivated welds, double bolt type with minimum band width of 6 inches, and rubber “O”-ring gasket pad meeting ASTM D2000.

3. Meet or exceed the ANSI/AWWA C800 standards, 200 psig.
4. Approved manufacturers:
    a. Romac Industries, Inc.
    b. Dresser Industries.
    c. The Ford Meter Box Company.
    d. Approved equivalent.

D. Tapping Sleeve:
1. Stainless steel full wrap around body.
2. All stainless steel tapped outlet, nuts, bolts, washers.
3. Gasket to provide seal around full circumference of pipe.
4. Approved manufacturers:
    a. Romac Industries, Inc.
    b. The Ford Meter Box Company.
    c. Approved equivalent.

E. Stainless Steel Couplings:
1. All type 304 stainless steel middle ring, followers, nuts, bolts, and washers construction.
2. Minimum length as required for joining cast iron pipe sizes as shown on plans.
3. Minimum rated working pressure of 250 psi.
4. Buna N rubber “O”-ring gaskets.
5. Approved manufacturers:
    a. Dresser Industries, Style 38.
    b. Approved equivalent

F. Transition Couplings:
1. Long pattern, sleeve type, ductile iron couplings, meeting the requirements of ANSI/AWWA C110/A21.10 and rated for 250 psig.
2. Epoxy or nylon coated inside and out.
3. Where pipes of dissimilar metal are joined, ensure dielectric insulation to prevent galvanic corrosion.
4. Install with stainless steel bolts.
5. Provide polyethylene encasement.
6. Approved manufacturers:
    a. Power Seal

b. Ford
c. Romac
d. Approved equivalent

2.13 TRENCH INSULATION

A. Trench insulation shall be extruded rigid board material. The insulation shall have a thermal conductivity of not more than 0.28 BTU per hour per square foot per degree Fahrenheit per inch of thickness as tested in accordance with ASTM C177. The insulation shall not absorb moisture to an extent greater than 2.5 percent by volume as tested in accordance with ASTM D2127. The compression strength of the insulation shall be greater than 20 psi as tested in accordance with ASTM D1621. The density of the insulation shall be between 0.9 and 1.3 pounds per cubic feet as tested in accordance with ASTM D1622.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall verify location of piping and piping systems as shown on the Drawings.

B. Contractor shall be aware that it may be necessary to move a piping run a reasonable amount or shift it slightly up or down to avoid an existing obstruction or other piping runs. Contractor shall not receive additional compensation due to slight shift or movement of piping runs.

C. Not all fittings may be shown on the Drawings, the fittings shown are meant to give a graphical representation only. Additional fittings required for differences in vertical and/or horizontal alignment may be required. Contractor shall not receive additional compensation due to additional fittings required to meet vertical and horizontal alignments.

D. The Drawings show two (2) dimensional graphical representation of piping systems, Contractor shall note there may need to be additional pipe length due to the vertical elevation differences that may not be represented on the drawings.

E. All buried piping with less than six (6) feet of cover shall be insulated. Trench insulation shall be provided above the pipe with a minimum thickness of four (4) inches as shown on the drawings for all piping.

F. Contractor has ability to modify the inverts of the potable water to avoid pipe conflicts. The potable water lines have been set constant elevations throughout the site. Contractor shall have the ability to modify invert elevations as long as six (6) feet of cover has been maintained.

G. All joints shall be properly restrained in accordance with these specifications.

H. Contractor shall provide dewatering as necessary, piping shall not be laid in water or wet conditions.

I. See Section 31 23 33 for all trench excavation and backfill requirements, and piping

system bedding requirements.

J. See Division 40 for all exposed process piping and valves.

3.02 PREPARATION AND STORAGE

A. Store pipe on-site on flat surface so barrel is evenly supported. Do not stack higher than 6 feet. Cover pipe with opaque material for extended storage.

B. Remove scale and dirt on inside and outside before assembly. Inspect for damage to pipe and other materials before installation.

3.03 INSTALLATION – PIPE, VALVES, AND APPURTENANCES

A. The type, kind, and class of pipe to be used shall be as shown on the Drawings. All pipes shall be laid and to the required line and grades.

B. Install all pipe and appurtenances in strict accordance with manufacturer's recommendations.

C. All foreign material or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying.

D. Pipe materials shall be handled carefully. Damage to protective coatings, linings, and joint fittings shall be cause for rejection of the materials. Prior to installation each pipe section, fitting, or valve shall be thoroughly inspected by the Contractor to detect damage or defects. Contractor shall inform Engineer of such damage or defects. Any defective, damaged, or gravity piping which has had its grade or joint disturbed after layer shall be replaced.

E. Cut pipe in a neat and workmanlike manner without damaging the pipe. Cutting of pipe for connections or pipe run lengths or inserting of fittings and valves shall be done in accordance with pipe manufacturer recommendations. Rough edges shall be removed and where rubber gasket joints are used, the outer edge shall be beveled by grinding or filing to produce a smooth fit.

F. Trench preparation shall proceed in advance of pipe installation only so far as can be backfilled the same day, or as permitted by the Owners specifications.

G. Excavate, and backfill excavations and trenches in accordance with Section 31 23 33.

H. Keep trenches free from surface and ground water until pipe jointing is complete.

I. All fittings shall be set on cast in place or precast concrete blocks in order to prevent the weight from being transmitted to the pipe. Before concrete is placed around fittings and appurtenances, the appurtenance and pipe shall be wrapped with polyethylene to completely isolate the concrete from the water main construction.

J. Form and place concrete for thrust blocking at each bend, tee, or change of direction. Thrust blocks shall bear on undisturbed earth.

K. Securely close open ends of pipe and fittings when Work is not in progress.

L. Pipe Installation:

1. Install piping to lines, grades, and dimensions shown on Drawings.
2. Take up and relay any pipe disturbed from its required grade or alignment.
3. Install pipe to allow for expansion and contraction without stressing pipe.
4. Install pipe such that maximum deflections from straight line or grade do not exceed manufacturer's specifications. Install bend fittings where maximum deflections are exceeded.
5. Notify Engineer and Owner at least 48 hours in advance of service disruptions and connections.

M. Prior to pipe placement the bedding conditions shall be such as to provide uniform and continuous support for the pipe. For belled pipe, bell holes shall be excavated as necessary to make the joint connections and provide proper support. Pipe shall not be laid in water or unsuitable bedding conditions. See Section 31 23 33 for bedding requirements.

N. Piping shall be carefully lowered into laying position by the use of suitable restraining devices. The pipe shall not be dropped or dumped into the trench. All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are placed into position. Pipe joints shall be kept clean prior to and during installation. The joint surface shall be inspected prior to placement to ensure that there is no foreign matter, coating blisters, projections, rough edges, or damaged gaskets that may impact the integrity of the joint connection.

O. As each length of pipe is placed in laying position the pipe shall be secured in place with approved backfill material and the appropriate compaction as specified in Section 31 23 33.

P. Bell and spigot piping shall be laid with the bell ends facing upgrade and the laying shall start at the downgrade end and proceed upgrade, unless otherwise permitted by the Engineer.

Q. When pipe laying is not in progress the open ends shall be closed by watertight plugs or other approved means. In the presence of water, the pipe end shall remain sealed until the trench has been properly drained or dewatered.

R. At connections to existing piping, Contractor shall remove all dirt and debris that is allowed to enter the existing lines.

S. Inspection: Do not cover pipe and fittings until all bedding, joints, and polyethylene wrap have been inspected.

T. Replace any pipe, fittings, or appurtenances found defective after installation has been completed.

U. PVC pipe used for force main and water main shall be installed in accordance with AWWA C605, AWWA Standard for Underground Installation of PVC Pressure Pipe and

Fittings for Water.

3.04 PIPE THRUST RESTRAINT

A. Provide all crosses, tees, bends, caps, and other thrust points in the piping system with suitable means of overcoming thrust.

B. Concrete reaction blocking and/or retainer glands or tie rods may be used subject to the Engineer's approval. All rods, nuts, bolts, and hardware shall be stainless steel. At tees, 90 degree bends, and dead ends both mechanical type joint restraint and concrete reaction blocking shall be required.

C. Concrete reaction blocking shall be placed so that pipe and fitting joints are accessible for repair, and in such a manner as to provide bearing against undisturbed earth. Pressure testing shall not proceed until concrete reaction blocking has reached its design strength. High early strength concrete may be used.

D. The following table is based upon the results of the Ductile Iron Pipe Research Association thrust restraint design program for a test pressure of 150 psig, backfill soil density of 90 pounds per cubic foot, and polyethylene wrapped pipe. The table shows the minimum length of pipe to be restrained for various types of fittings where joint retainer glands are used. The minimum concrete reaction block size is shown in parentheses under the minimum length.

Pipe Diameter (inches)	**Dead End Tee Branch 90° Bend**	**Wye 45° Bends or less**
4	26 LF (3.1 SF)	11 LF (2.0 SF)
6	26 LF (3.1 SF)	11 LF (2.0 SF)
8	34 LF (5.3 SF)	14 LF (3.0 SF)
10	42 LF (8.1 SF)	17 LF (4.4 SF)
12	50 LF (13.4 SF)	20 LF (6.6 SF)
14	58 LF (17.2 SF)	23 LF (9.2 SF)
16	64 LF (21.4 SF)	27 LF (11.6 SF)
18	71 LF (25.2 SF)	30 LF (15.2 SF)
20	79 LF (30.2 SF)	33 LF (18.1 SF)
24	93 LF (38.5 SF)	39 LF (26.1 SF)

30	112 LF (52.5 SF)	46 LF (34.5 SF)
36	132 LF (65.4 SF)	56 LF (40 SF)
42	167 LF (82.5 SF)	70 LF (49 SF)

3.05 POLYETHYLENE ENCASEMENT

A. Where required all piping, fittings, valves, and appurtenances shall be fully encased in polyethylene film tubing.

B. The polyethylene tubing shall be of appropriate size for the size of pipe being installed. Install polyethylene tubing prior to lowering pipe into trench.

C. Tubing length shall be long enough to provide a minimum of one (1) foot overlap at all joints, fittings, and appurtenances. After completing the pipe jointing and positioning the tubing material, the overlap shall be secured into place with plastic adhesive tape wrapped circumferentially around the pipe at least three (3) full turns.

D. The fit shall be snug over the pipe with no excess or bunched up material. Repair all rips, punctures, or other damage with taping and overlapping patching.

3.06 TESTING GRAVITY LINES

A. Gravity lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service. Each test section of the sewer shall be subjected to exfiltration testing, either by hydrostatic or air test method as described below and at the Contractor’s option. The requirements set forth for maximum leakage shall be met as a condition for acceptance of the gravity line section represented by the test.

B. If the ground water level is greater than three feet above the pipe invert elevation of the upper manhole and the Engineer so approves, infiltration testing may be allowed in lieu of the exfiltration testing, in which case the allowable leakage shall be the same as would be allowed for the Hydrostatic Test.

C. Testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall provide necessary equipment and materials, including plugs and standpipes as required.

D. Air Test Method

1. Air testing shall conform to ASTM C 924 for concrete pipe and ASTM F 1417 for plastic pipe and ductile iron.

2. The pipeline shall be sealed with plug whose sealing length is greater than the diameter of the pipe and constructed in such a nature that it will not require external blocking or bracing and maintain a seal against the line's test pressure.

3. Wyes, tees, outlets or ends of laterals shall be suitably capped and braced to

withstand the internal pressures. Such caps or plugs shall be easily removable.

4. One plug shall be tapped for the air supply hose and the return air pressure hose. The air supply hose, connected from the compressor to the plug shall have a throttling valve, bleeding valve and shut off valve for control. The air pressure tap shall have a sensitive pressure gauge, 0 to 10 psi range, protected by a gauge cock and a pressure relief valve set at 10 psi.
5. In performing the test, air is added slowly to the pipeline until pressure inside the pipeline reaches 4.0 psi. If air is added too rapidly, the test accuracy will decrease because a change in temperature also has an effect on the change in pressure. When the air pressure inside the pipeline reaches 4.0 psig above external hydrostatic pressure, the supply air is stopped. A minimum two-minute time interval is allowed for the temperature difference to stabilize before the actual test is performed. If the air pressure drops below 3.5 psig during this time interval, more air will be supplied to the pipeline and throttled to maintain a pressure between 3.5 psig and 4.0 psig for a minimum of two minutes after which time the supply air will be shut off.
6. The portion of line being tested shall be accepted if the portion under test does not lose air at a rate greater than 0.0015 cfm per square foot (for PVC) or 0.003 cfm per square foot (for RCP) per internal pipe end area at an average pressure of 3.0 psig greater than any back pressure exerted by groundwater that may be over the pipe at the time of test.
7. The test shall be accomplished by determining the time in minutes for the pressure to decrease from 3.5 psig to 3.0 psig greater than the average groundwater pressure that may be over the pipe. That time shall not be less than the time shown on the given diameter in the following table:

Gravity Line Diameter (Inches)	Minutes for DIP
4	1.9
6	2.8
8	3.8
10	4.7
12	5.7
15	7.1
18	8.5
21	9.9
24	11.3
27	12.8
30	14.2
33	15.6
36	17.0
42	19.8

8. For pipe lengths exceeding 100 feet, the following table of times shall be used per every 100 feet of pipe. All other testing parameters and requirements shall remain:

Gravity Line Diameter (Inches)	Minutes for DIP
4	1.9
6	2.8
8	3.8
10	4.8
12	5.7
15	7.1
18	9.7
21	13.1
24	11.4
27	14.5
30	17.8
33	21.6
36	25.7
42	28.5

9. If the pipeline fails to meet the requirement of the test, the Contractor shall, at Contractor's own expense, determine the source of leakage and then repair or replace all defective material and workmanship.

10. In determining the pressure greater than the average groundwater, the groundwater height in feet above the pipeline must be measured.

11. When the water elevation has been established, the height in feet above the pipeline shall be divided by 2.31 and that pressure added to gauge pressure of test.

3.07 HYDROSTATIC TEST METHOD

A. After bulkheading the test section, the pipe shall be subjected to a hydrostatic pressure produced by a head of water at a depth of three feet above the invert elevation of the gravity line at the manhole of the test section. In areas where ground water exists, this head of water shall be three feet above the existing water table.

B. The water head shall be maintained for a period of one hour during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for an extended period of one hour the water head shall be maintained as the test period. During the one hour test period, the measured water loss within the test section, including service stubs, shall not exceed the Maximum Allowable Loss (in Gallons Per Hour per 100 Feet of Pipe) given below for the applicable Gravity Line Diameter.

Gravity Line Diameter (In Inches)	Maximum Allowable Loss* (In Gallons Per Hour Per 100 Feet)
6	0.5
8	0.6
10	0.8
12	1.0
15	1.2
18	1.4
21	1.7

24 & Larger	1.9
* Based on 100 Gallons Per Day Per Pipe Diameter Inch Per Mile	

C. If measurements indicate exfiltration within a test action section is not greater than the allowable maximum, the section will be accepted as passing the test.

3.08 TEST FAILURE AND REMEDY

A. In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. Repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

B. Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor' expense.

3.09 TESTING PRESSURE MAINS

A. Hydrostatic Testing of Pressure Mains

1. After the pipe has been laid, including fittings and valves and blocking, all newly-laid pipe or any valved section thereof, unless directed otherwise by the Engineer, shall be subject to hydrostatic pressure of 150 pounds per square inch. The duration of each test shall be at least two hours.

2. Each section of pipe to be tested shall be filled with water and all air expelled at the highest point. The required taps to expel air or to fill the water main shall be supplied and installed by the Contractor and shall be 3/4 inch and shall include an approved service saddle when required.

3. The test apparatus shall be applied at the lowest elevation on the section to be tested. The apparatus shall be connected to the line at a service tap or special tap location.

4. The pressure gauge shall be a standard pressure gauge. The dial shall register from 0 - 200 psi and have a dial size of 4 1/2 inches with 1 psi increments.

5. The hydrostatic test, pressure requirement for an acceptable test shall be a maximum pressure drop of 2 psi during the last hour of the two hour pressure test. If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met at no cost to Owner.

B. Operational Inspection

1. Before substantial completion of the work and in the presence of the Engineer and the Contractor, representatives of the Owner shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb and centered; and that water is available at all curb stops.

3.10 DISINFECTION OF POTABLE WATER SYSTEM

A. Flush and disinfect system in accordance with Section 33 01 10.

3.11 POTABLE WATER SEPARATION

A. Unless otherwise specified in Contract Documents, the potable water lines shall generally be placed with the minimum specified cover. However, a greater depth may be required to clear process piping, storm, and sanitary sewers and sewer services, and no additional compensation shall be provided for such adjustments.

B. In locations where sewer is in direct conflict with existing water main and water services the water main and water services shall be lowered to provide at least 18 inches of vertical distance between the top of the water main or service and the bottom of the sanitary or relocated in accordance with the Drawings. No additional compensation will be made for lowering the water main.

C. Water mains crossing above process piping, storm, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used:

1. Sewers passing over or under water mains shall be constructed of materials equal to water main standards of construction for a distance of at least 10 feet on either side of the water main.

2. Water main passing under sewers shall, in addition, be protected by providing:

   a. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.

   b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water mains.

   c. A length of water pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

3. Water mains shall be laid at least 10 feet horizontally from any process piping, sanitary sewer, or storm sewer, whenever possible. When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:

   a. The bottom of the water main is at least 18 inches above the top of the sewer.

   b. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

D. No deviation shall be made from the required line or grade except with the consent of the Engineer.

3.12 FIELD QUALITY CONTROL

A. Section 01 45 00 - Quality Assurance.

3.13 DATA FOR AS-BUILT RECORDS

A. Record stationing and/or ties of all fittings, valves, and other underground appurtenances installed on sheets provided for such purposes by the Engineer. Include invert or centerline elevations.

END OF SECTION 33 31 19

DIVISION 40

PROCESS INTERCONNECTIONS

SECTION 40 27 00
PROCESS PIPING - GENERAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of the following, as indicated, in accordance with the provision of the Contract Documents:

1. Pipe, fittings, wall pipes, and connections associated with interior Work.

B. Related section include:

1. Section 01 10 00 – Summary of Work
2. Section 01 33 00 – Submittal Procedures
3. Section 01 40 00 – Quality Control
4. Section 01 60 00 – Product Requirements
5. Section 09 90 02 – High Performance Painting and Coating
6. Section 40 27 05 – Process Piping Support Systems
7. Section 40 27 10 – Process Piping Specialties
8. Section 40 27 20 - Process Valves
9. Section 40 42 13 – Process Piping Insulation
10. Section 40 71 13 – Magnetic Flow Meter

1.02 REFERENCES

A. Reference Standards include:

1. American National Standards Institute (ANSI)
2. American Society of Mechanical Engineers (ASME)
3. American Society for Testing Materials (ASTM)
4. American Water Works Association (AWWA)
5. American Welding Society (AWS)
6. National Sanitation Foundation (NSF)
7. ANSI/AWWA C104/A21.4: Cement-Mortar Lining for Gray-Iron and Ductile-Iron Pipe and Fittings for water.
8. ANSI/AWWA C105/A21.5: Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for water and other liquids.
9. ANSI/AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1,219 mm), for Water.
10. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe

and Fittings.

11. ANSI/AWWA C115/A21.15: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
12. ANSI/AWWA C150/A21.50: Thickness Design of Ductile-Iron Pipe.
13. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand Lined Molds for water or other liquids.
14. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
15. ASME B16.22: Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
16. ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes.
17. ASTM B 88: Seamless Copper Water Tube.
18. ASTM D-1784: Rigid Poly(Vinyl Chloride) Compounds and Chlorinated
19. Poly(Vinyl Chloride) Compounds.
20. ASTM D-1785: Poly(Vinyl Chloride) (PVC) Plastic Pipe, schedules 40, 80, 120.
21. ASTM D-2464: Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
22. ASTM D-2467: Socket Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
23. ASTM D-2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
24. ASTM D-2855: Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
25. AWWA C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
26. AWWA C606: Grooved and shouldered type joints.
27. AWWA C651: Standard for Disinfecting Water Mains.
28. AWWA C653: Disinfection of Water Treatment Plants.
29. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 12 In., for Water.
30. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. through 48 In., for Water Transmission and Distribution.
31. NSF Standards No. 60 and 61 – National Sanitation Foundation.

1.03 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ANSI/AWS D.1.1.

B. Employ certified welders.

C. Piping modifications subject to Engineer's review. No additional compensation allowed

for modifications required to suit equipment furnished by Contractor.

1.04 SUBMITTALS

A. Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures for all pipe and fittings indicating: Name of Manufacturer, Materials, Standard Dimensions, References, and Joint Data.

B. Submit Affidavit of Compliance for ductile iron pipe and fittings.

C. Submit design calculations for structural design of pipe thickness where pipe class or thickness is not specifically called out.

D. Submit detailed piping layout drawings showing piping and connections to equipment and appurtenances.

1.05 COATING AND IDENTIFICATION SYSTEMS

A. All material and equipment in this section shall be factory primed. Primer shall be compatible with finish coats of paint provided under Section 09 90 02 – High Performance Painting and Coating.

B. The Contractor shall refinish and restore to the original appearance all equipment that has sustained damage to the manufacturer's finish or prime coats of paint or enamel.

C. Finish painting of all materials and equipment in this Section shall be the responsibility of the Contractor, and shall be as described Section 09 90 02 – High Performance Painting and Coating, unless otherwise specifically indicated.

D. All *interior* ductile iron pipe (DIP) shall be either:

1. Installed with no asphaltic varnish coating (only red primer) and coated in accordance with System 2 of Section 09 90 02 of these specifications;

2. Installed with asphaltic varnish coating (properly cleaned) and coated in accordance with 09 90 02 D.1.f of these specifications.

1.06 REGULATORY REQUIREMENTS

A. All Products that may come into contact with water intended for use in a Public Water System shall meet ANSI/NSF International Standards 60 and 61, as appropriate. A Product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each Product.

PART 2 - PRODUCTS

2.01 PIPE SCHEDULE

A. Process Piping:

1. Ductile Iron.

2. Stainless Steel.

3. PVC.

B. Other Piping:

1. CPVC (*for all interior potable and non-potable plumbing).*
2. HDPE.
3. Copper.
4. Steel Pipe.
5. PE Jacketed, PE Insulated Steel Pipe – *(for interior blower discharge)*
6. As otherwise shown on Drawings or specified in other Sections.

2.02 DUCTILE IRON PIPE AND FITTINGS

A. Approved Manufacturers:

1. American Cast Iron Pipe Company.
2. U.S. Pipe.
3. Or approved equivalent.

B. General

1. Minimum Pressure Class (Pounds per Square Inch – PSI):
   a. Interior and exterior exposed, flanged:
      i. 12-inch diameter and smaller: 350 PSI.
      ii. 14-inch diameter and larger: 250 PSI.
2. Onsite inspection of all materials by Contractor.
3. Pipe coating:
   a. Buried and submerged: bituminous coating (asphalt coating).
   b. Interior and exposed: prime coat.
4. Bolts and nuts:
   a. Buried exposed and submerged: stainless steel.
   b. Interior and exposed: stainless steel.
5. Pipe lining:
   a. All pipelines except air lines: cement-mortar.
   b. Ductile iron pipe for air lines shall be unlined.
6. Submit design calculation for structural design of pipe thickness where pipe thickness or class is not specifically called out.
7. Pipe and fittings to match face and drill of valves.
8. All flanges shall be full-faced flanges.
9. All materials to be new and unused.

10. Pipe and fitting material: ductile iron.

C. Pipe: ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

D. Flanged Pipe: ANSI/AWWA C115/A21.15.

1. Minimum Class: Class 53.

E. Fittings:

1. Flanged fittings:

a. Conform to ANSI/AWWA C110/A21.10.

b. Full face gaskets, bolts, and nuts: AWWA C110, Appendix A.

c. Material: ductile iron.

2. Reducers: all reducers shall be concentric pattern unless noted otherwise on the Project Drawings.

F. Based Fittings:

1. Conform to ANSI/AWWA-C110/A21.10.

2. All side-based and flange-based fittings must be fully faced and drilled.

G. Coatings and Linings:

1. Asphaltic: ANSI/AWWA C110/A21.10 and ANSI/AWWA C151/A21.51.

2. Cement lining: ANSI/AWWA C104/A21.4.

3. Prime coat: per Section 09 90 02 – Mechanical Painting and Coating.

H. Joints - Pipe and Fittings:

1. Flanged: ANSI/AWWA C110/A21.10 and ANSI/AWWA C115/A21.15.

2. Provide type of joint as indicated on Project Drawings.

3. Use of grooved and shouldered joints is acceptable where approved by Engineer.

a. Conform to AWWA C606.

4. The Engineer will only accept Uni-Flanges or approved equivalent at locations that receive prior approval.

I. Wall sleeves: wall sleeve shall be provided where ductile iron pipe passes through concrete walls and no thrust restraint is required. Wall sleeves shall be utilized unless a wall pipe is used. Wall sleeves shall be Schedule 40 PVC or galvanized carbon steel as specified on the project drawings. Wall sleeves shall be as manufactured by Metraflex or approved equal.

J. Wall Pipe and Wall Collar: All wall pipes and collars shall be Class 53 ductile iron with the collar continuously welded around the entire circumference and shall be rated a minimum of 250 psi. All wall pipes and collars shall be fabricated such that they are suitable in all thrust restraint applications where there is a concrete penetration. Wall

pipes and collars shall be as manufactured by U.S. Pipe or approved equal.

K. Sleeve Seals: All pipes passing through wall sleeves unrestrained where indicated on the Drawings will be provided with a sleeve seal similar to the Model C Link-Seal® Modular Seal or pre-approved equal.

2.03 STAINLESS STEEL PIPE

A. ASTM A-312 stainless steel pipe, Schedule 40, Type 304 with stainless steel drilled flanges, rated for 175 psi minimum, sizes 2-inch through 6-inch. Schedule 80, Type 304 stainless steel with stainless steel drilled flanges, sizes 8-inch through 12-inch.

1. Onsite inspection by Contractor of all materials.
2. Bolts and nuts: stainless steel.
3. Pipe and fittings to match face and drill of valves.
4. All materials to be new and unused.

B. Stainless Steel Pipe for (*if applicable)*

1. ASTM A-312 stainless steel pipe, Schedule 10, Type 304L
2. Size: As indicated on Construction Drawings and pipe schedule.
3. Joints: 304L stainless steel welding neck flanges conforming to ANSI B16.5.
4. Pressure: Rated for 175 psi minimum at 150°F.
5. Pipe shall be electric fusion welded.

2.04 PVC PIPE AND FITTINGS

A. PVC pipe and fittings furnished shall be of the type as specified below for each particular use or type of installation.

B. Pressure Piping (4-inches diameter through 12-inches diameter)

1. PVC pressure pipe in sizes 4 – 12 inches in diameter shall conform to all applicable requirements of ANSI/AWWA C900 or C909 as applicable or indicated in the drawings. Pipe utilized for potable water shall be NSF certified for use in the transport of potable water.
2. The pipe and fittings shall meet cast iron pipe equivalent outside diameters and shall be minimum Class 150 (DR18) or Class 200 (DR14) pipe as indicated on the drawings, and shall meet the requirements of Table 2 of AWWA C900 or C909 as applicable.
3. Flanges for connecting plain end PVC pipe to equipment shall be Uni- flange series 900, ROMAC, or equal.
4. Pipe, fittings, and valves shall be installed in compliance with manufacturer’s recommendations.

C. Pressure Piping (less than 4-inches in diameter) and Non Pressure Piping

1. Schedule 80, unless specified otherwise, conforming to ASTM D-1785.
2. Materials: ASTM D-1784, Type 1, Grade 1.
3. Pipe Coating:
    a. Buried and submerged: None
    b. Exposed and Interior: Painted as Specified in Section 09 90 02 – Mechanical Painting and Coating.
4. Fittings: ASTM D-2467, socket type; or ASTM D-2467, flange type; or ASTM D-2464, threaded type; as required or as indicated on Drawings.
5. Solvent Cement: ASTM D-2564, Primer (ASTM F656) and PVC Solvent Cement.
6. Polyvinyl chloride fittings shall be limited to a 3-inch diameter or less.

D. Contractor shall replace all PVC pipe that has been UV baked/damaged at no additional cost to the Owner.

2.05 CPVC PIPE AND FITTINGS

A. Pipe, fittings, and valves shall be manufactured from a CPVC compound which meets the requirements of class 23447-B, Type 4, Grade 1 in accordance with ASTM D1784. Compound from which the pipe is produced shall have a design stress rating of 2,000 psi at 23 degrees C, listed by the Plastic Pipe Institute (PPI).

B. Fittings and valves shall meet the requirements of ASTM F439 (schedule 80 socket) or ASTM F437 (schedule 80 threaded).

C. All socket type connections shall be joined with CPVC solvent cement conforming to the requirements of ASTM F493.

D. All CPVC shall be Schedule 80.

E. Approved Manufacturers:

1. Georg Fischer.
2. Hayward.
3. Asahi/America.
4. Spear.

2.06 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. All high density polyethylene pipe shall be DR 11, unless specified otherwise, conforming to ANSI D-2239.

B. All HDPE pipe to have standard ductile iron pipe size (DIPS) dimensions.

C. All pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults. The physical appearance of the pipe having deformities such as concentrated ridges, discoloration, excessive spot roughness,

pitting, varying wall thickness, etc., shall constitute sufficient basis for rejection.

D. Ductile Iron Fittings:

1. All ductile iron fittings connecting to polyethylene pipe are required to include stainless steel sleeve inserts inside the pipe and PE electrofusion MJ adapters as manufactured by Central Plastics Company or approved equivalent.

2. PE electrofusion fittings may be substituted for ductile iron fittings at no additional cost to Owner. Fitting and piping shall be heat fused in accordance with ASTM D2657. Butt fusion fittings shall conform to ASTM D3261.

3. Push-on or mechanical rubber gasket joints conforming to the compression gasket ring requirements of ANSI/AWWA C111/A21/11 and ASTM D3139, and as shown on Drawings.

4. Provide stainless steel nuts, bolts, and glands.

2.07 COPPER TUBE AND FITTINGS

A. Copper pipe to be used for pipe sizes less than 4 inch diameter.

B. Dielectric unions shall be used between copper water tube and dissimilar metal piping.

C. Hard Copper Tube: ASTM B88, Types L and M (ASTM B88M, Types B and C), water tube, drawn temper. Type K for underground services.

1. Copper Pressure Fittings: ASME B16.18, cast-copper alloy or ASME B16.22, wrought-copper, solder joint fittings.

2. Bronze Flanges: ASME B16.24, Class 300, with solder joint end.

3. Copper Unions: MSS SP-123, cast-copper alloy, hexagonal stock body, with ball and socket, metal to metal seating surfaces and solder joint or threaded ends.

4. Copper, Grooved End Fittings: ASTM B75 (ASTM B75M) copper tube or ASTM B584 bronze castings.

a. Copper Tubing, Keyed Couplings: Copper tube dimensions and design similar to AWWA C606. Included ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

5. Aboveground Water Piping: Use the following piping materials for each size range:

a. NPS 1-1/2 (DN 40) and Smaller: Hard copper tube, Type L (Type B); and soldered joints.

b. NPS 2 (DN 50): Hard copper tube, Type L (Type B); and soldered joints.

c. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Hard copper tube, Type L (Type B); and soldered joints.

6. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

a. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN50) and

smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

7. Soldered Joints: Use ASTM B 813, water-fusible, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

2.08 STEEL PIPE AND FITTINGS

A. Steel Pipe, NPS 2" (DN 50) and Smaller: ASTM A 53, Type S (seamless) or Type F (furnace-butt welded), Grade A, Schedule 80, galvanized steel, threaded ends per ASME/ANSI B1.20.1.

B. Steel Pipe, NPS 2-1/2" through NPS 12" (DN 65 through DN 300): ASTM A 53, Type E (electric-resistance welded), Grade A, Schedule 40, black steel, plain ends. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced.

C. Steel Pipe, NPS Greater than 12": ERW standard wall, thickness of 0.375 inch, continuous spiral welded conforming to ASTM A-53 standards.

1. On-Site inspection by Contractor of all materials.
2. Pipe Coating:
    a. Epoxy Lining: NSF International Standards 60 and 61.
    b. Exposed: Shop Prime Coated and finish coat as specified in Section 09 90 02 – Mechanical Painting and Coating.
3. Flanges: ASME B16.5, Class 150-lb. slip on flanges, double welded.
4. Bolts and Nuts: Stainless steel.
5. Pipe and fittings to match face and drill of valves.
6. All materials to be new and unused.
7. Mechanical couplings: Dresser Style 38 or approved equal.
8. Unions: Fed Spec. WW-U-531, Class 2, Type A (black) for ungalvanized pipe.
9. Threaded fittings: ASME B16.4, Class 125.

D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Grooved Mechanical-Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 (ASTM A 47M), Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders designed to accept grooved end couplings.

F. Grooved Mechanical-Joint Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

G. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig (1035-kPa) minimum working pressure and 250

deg F (121 deg C) maximum operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch (20-mm) misalignment.

H. Spherical, Rubber, Flexible Connectors: Fiber-reinforced rubber body with steel flanges drilled to align with Classes 150 and 300 steel flanges; operating temperatures up to 250 deg F (121 deg C) and pressures up to 150 psig (1035 kPa).

I. Welding Materials: Comply with Section II, Part C, of the ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

J. Gasket Material: Thickness, material, and type suitable for fluid to be handled; and design temperatures and pressures.

K. PIPE INSULATION AND JACKET

1. Blower exhaust piping and fittings shall be insulated with a minimum 1" thick layer of fiberglass insulation or approved equal;

2. Pipe and fittings insulation shall be protected by an aluminum jacket specifically sized for the application. Jacket shall include 3-mil polyfilm moisture barrier heat laminated to the interior surface. Product shall be ITW Aluminum jacket from General Insulation Company, Inc.

2.09 PIPE CORROSION PROTECTION

A. Coatings: See Section 09 90 02 – High Performance Painting and Coating, for details of coating requirements.

B. Heat Shrink Wrap:

C. Type: Cross-linked polyolefin wrap or sleeve with mastic sealant.

D. Manufacturer and Product: Raychem; WPC or TPS, or equal.

2.10 FLANGE INSULATING GASKET KITS

A. Approved Manufacturer:

1. Advance Products & Systems.

2. Approved Equivalent.

B. Size: per diameter of flange.

C. Pressure rating: meet minimum pressure rating of attached piping.

D. Provide to meet either full-faced or raised faced portion of flange.

1. Full-Faced Gasket

a. Type E gaskets.

b. Precision cut bolt holes.

c. Material: plain face or Neoprene face phenolic.

2. Raised Face Portion
    a. Type F gaskets.
    b. Inside diameter of the bolt hole circle should be slightly smaller than the outside diameter of the gasket, assuring an exact, automatic positioning of the gasket.
    c. Material: plain face or Neoprene face phenolic.

E. Provide insulating sleeve and washer with the single insulation sets.
    1. Material: high density polyethylene (HDPE), phenolic, and Mylar.
    2. Provide with each set a 1/8” thick S.A.E. electro-plated steel washer.

2.11 COUPLINGS, TAPS, AND MISCELLANEOUS JOINTS

A. Tapping saddles and tapping sleeves shall be Mueller, or equal.

B. Provide pipe repair clamps where indicated on the Drawings. Pipe repair clamps shall be suitable for potable water service with all type 304 stainless steel bolts and hardware. Contractor shall verify pipe outside diameter and necessary length before placing clamp. Pipe repair clamps shall be Mueller Series 510 XTRA-RANGE Full Seal type, or equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Make necessary field measurements to determine pipe laying lengths; fabricate pipe; deliver pipe to site; store pipe with ends capped to prevent contamination and damage to interior; prepare pipe for installation; work pipe into place without forcing or springing.

B. Do not store or ship small diameter pipe inside larger diameter pipe.

C. Ream pipe and tube ends. Remove burrs. Repair lining at pipe cuts.

D. Remove scale and dirt, inside and outside, before assembly.

E. Remove welding slag or foreign material from pipe and fitting materials.

F. Remove temporary preservative coatings from valves, fittings, and appurtenances prior to installation.

G. Clean, repair, or replace equipment malfunctioning due to presence of foreign material left in piping during installation or entering piping after installation due to Contractor's work at no cost to Owner.

3.02 DUCTILE IRON PIPE AND FITTINGS

A. Joints:
    1. Interior submerged: flanged.
    2. Interior exposed: flanged, grooved and shouldered if approved by Engineer, except where indicated otherwise on the Project Drawings.

B. Flanged Joints:

1. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

2. Care shall be taken to avoid restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress in the flanges when bolting flanged joints.

3. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be gradually tightened and at a uniform rate, to ensure uniform compression of the gasket.

4. Special care shall be taken when connecting piping to pumping equipment to ensure that piping stresses are not transmitted to the pump flanges. All connecting piping shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of the flanges is obtained before any bolts are installed in the flanges.

C. Penetrations:

1. Install pipe straight through concrete walls or floors.

2. Provide wall sleeves where ductile iron pipe passes through concrete walls and floors, unless specified otherwise on Project Drawings.

3. Install wall pipes or sleeves as shown on Project Drawings.

4. Install embedded wall flange in center of wall or floor and grout in place when embedded wall pipe flange shown on Project Drawings.

5. Fabricate wall pipes to dimensions required.

D. Support pipe at fittings with rods; anchor and support in accordance with Section 40 27 05 – Process Piping Support Systems

E. Pipe and fittings to match face and drill of valves and appurtenances.

3.03 THREADED JOINTS

A. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before assembly to remove all burrs.

B. Threaded joints in plastic piping shall be made with Teflon thread tape applied to all male threads. At the option of the Contractor, threaded joints in other piping may be made up with Teflon thread tape, thread sealer, or a suitable joint compound. Thread tape and joint compound or sealers shall not be used in threaded joints that are to be seal welded.

3.04 COMPRESSION JOINTS

A. Ends of tubing shall be cut square and all burrs shall be removed. The tubing end shall be

fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns and not more than 1-1/2 turns past fingertight, or as recommended by the fitting manufacturer, to produce a leaktight, torque- free connection.

3.05 SOLVENT WELDED JOINTS

A. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chambered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed.

3.06 PVC PIPE

A. Form solvent joints in PVC pipe and fittings to ANSI/ASTM D2855. Solvent joints are to be used only where threaded or flanged connections are inappropriate.

B. 2-inch and larger: make connections to equipment and supply lines with flanges, unless otherwise specified.

C. Under 2-inches: make connections to equipment and supply lines with solvent joints, unless otherwise specified.

3.07 DISSIMILAR PIPE CONNECTIONS

A. Provide non-conducting connections or flange insulating gasket kits wherever jointing dissimilar metals in open systems.

3.08 VENTS AND DRAINS

A. Vents and drains at high and low points in piping required for completed system may or may not be shown. Install vents on high points and drains on low points of pipelines as shown.

3.09 INSULATION

A. See Section 40 42 13 - Process Piping Insulation.

3.10 TESTING

A. Hydrostatically test each entire line in accordance with AWWA C600-99.

3.11 DISINFECTION

A. Disinfect all potable water lines in accordance with Section 33 13 00 – Disinfection of Water Systems.

3.12 FIELD PREPARATION AND PAINTING

A. All material and equipment in this section shall be factory primed, excluding PVC and copper, and field finish coated. Factory coatings shall be compatible with materials provided under Section 09 90 02 – High Performance Painting and Coating.

3.13 LEAKAGE

A. See Section 40 42 80 - Process Piping Leakage Testing.

B. All joints shall be watertight and free from leaks. All leaks shall be repaired by Contractor in a timely manner and at no expense to the Owner.

C. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed and replaced with new and acceptable materials, and the affected portion of the piping retested by and at the expense of the Contractor.

END OF SECTION 40 27 00

SECTION 40 27 05
PROCESS PIPING SUPPORT SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Pipe and equipment hangers, supports, and associated anchors.
2. Sleeves and seals.

B. Related Sections include:

1. Section 01 33 00 – Submittal Procedures
2. Section 05 50 00 – Metal Fabrications.
3. Section 09 90 02 – High Performance Painting and Coating.
4. Section 40 27 00 – Process Piping - General.
5. Section 40 27 10 – Process Piping Specialties

1.02 REFERENCES

A. Reference Standards include:

1. ANSI B 31.10: Pipe Supports.
2. ASTM A36: Structural Steel.
3. ASTM A325: High Strength Bolts for Structural Steel Joints.

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00. Indicate name of manufacturer, materials, standard dimensions, references, maximum loadings, and thrust restraints for all pipe support systems.

B. Provide a list of materials and corresponding suppliers.

C. Provide pipe support location and details with piping layout drawings for piping systems 4-inches and larger.

D. Submit Affidavit of Compliance certifying that materials furnished have been tested and are in compliance with specification requirements.

1.04 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ANSI/AWS D.1.1.

B. Employ certified welders as necessary to complete Work.

1.05 FIELD MEASUREMENTS

A. The Drawings indicate required pipe sizes and the general arrangement for major piping. Locations shall be verified in the field by the Contractor. Valves, fittings, and

appurtenances shall be of such dimensions to allow for the installation of this piping and supports substantially as shown on the Drawings. In the event it should become necessary to change the location of any of the work due to interference with other work, Contractor shall consult with the Engineer prior to making any changes and all such changes shall be made at no additional cost to the Owner.

B. Prior to roughing in any facilities or installation of piping and equipment, consult all related drawings including general, mechanical, electrical, etc., and inform self of materials, locations of structures, pipes, ducts, electrical conduits, etc., which may impact the installation of supports.

C. Discrepancies discovered before or after work has started, shall be brought to the attention of the Engineer immediately, and the Engineer reserves the right to require minor changes in the work to eliminate such discrepancies.

PART 2 - PRODUCTS

2.01 PIPE HANGER SUPPORTS

A. In certain locations, pipe supports, anchors and expansion joints have been indicated on the Drawings, but no attempt has been made to indicate every restraint, anchor, and expansion joint. It shall be the Contractor's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to anchor all piping in accordance with the requirements set forth herein. Additional pipe supports may be required adjacent to expansion joints, couplings, or valves.

B. Concrete and fabricated steel supports shall be as indicated on the Drawings, as specified in other Sections, or, in the absence of such requirements, as permitted by the Engineer.

C. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

D. Materials

1. Unless otherwise specified, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the structural and miscellaneous metals section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.

2. Unless otherwise specified or indicated on the Drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with galvanized finish or be fabricated of stainless steel.

3. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

4. Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.

5. Unless otherwise acceptable to the Engineer, the use of supports that rely on stressed

thermoplastic components to support the pipe will not be acceptable.

6. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.
7. Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to existing concrete and masonry.
8. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as required to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints.

E. Manufacturer and Type:

1. Anvil International, Catalog PH-5.10, or approved equivalent.
   a. Light welded steel bracket: Figure 194.
   b. Medium welded steel bracket: Figure 195
   c. Heavy welded steel bracket: Figure 199
   d. Concrete Inserts: Figure 281.
   e. Offset Pipe Clamp: Figure 103.
   f. Adjustable Clevis Hanger: Figure 260.
   g. Stainless Steel Hanger Rods.

2.02 FLOOR PIPE SUPPORTS

A. Approved Manufacturer and Type:

1. Anvil International, adjustable pipe saddle support: Figure 264.
2. Standon Model S92 Saddle Support.
3. PHD Manufacturing Inc., adjustable pipe saddle support. Figure 875
4. Or Approved Equivalent.

B. Minimum vertical adjustment: 4½ inch.

C. Provide complete with riser pipe and flange bolts for floor mounting.

D. Provide precast concrete or grout base a minimum of 1” above floor.

E. Provide as per recommended spacing, at minimum. Contractor shall install a minimum of one floor pipe support per pump discharge piping prior to the header piping.

F. Contractor may also be required to construct concrete saddle pipe supports for floor

piping as indicated on the Drawings. Contractor to provide all materials, formwork, and labor to construct as detailed on Drawings.

2.03 WALL SUPPORTS

A. Steel brackets shall conform to MSS Type 31 for light duty, MSS Type 32 for heavy duty, and MSS Type 33 for heavy duty. Brackets shall be sized accordingly for full size and weight of piping system. All mounting hardware shall be stainless steel.

B. Submerged piping shall be supported with Type 316 stainless steel hangers or steel bracket supports coated with two coats of bitumastic paint.

2.04 VERTICAL PIPE SUPPORTS

A. Two bolt riser clamps shall be MSS SP 69 Type 8 galvanized or plastic coated.

B. Four bolt riser clamps shall be MSS SP 69 Type 42 galvanized or plastic coated.

2.05 SADDLES AND SHIELDS

A. Protection saddles shall be MSS SP 69 Type 39.

B. Protection shields shall be MSS SP 69 Type 40.

C. Wood insulation saddle shall be Elcen Metal Products Company, or equal.

2.06 PREFABRICATED OR FABRICATED PIPE SUPPORTS

A. Pre-engineered support systems constructed of steel products factory fabricated by firms regularly engaged in the manufacture of these items shall be used for this work. Steel pipe support systems shall be blasted to a white clean condition after fabrication and hot-dip galvanized in accordance with ASTM 123, unless support is specified to be fabricated of stainless steel.

B. Free-standing pipe connections to equipment shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams. Frames shall be anchored to the structure.

C. Exterior, free-standing overhead piping shall be supported by fabricated pipe stands, made of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.

D. Special pipe supports for vertical and horizontal movement shall be as detailed on the drawings. Supports shall be fabricated by firms regularly engaged in the manufacture of these items.

2.07 SLEEVES AND SEALS

A. Wall pipes shall connect piping to concrete structure. Wall pipes shall be ductile iron meeting the requirements of AWWA C115. Provide wall pipes where indicated on Drawings.

B. Wall pipes shall be provided at all instances where piping penetrates concrete walls, floors, or foundations for the buildings and the polishing reactor.

C. Wall sleeves shall be ductile iron meeting the requirements of AWWA C151. Sleeves

shall have cast waterstop collar. Cast waterstop collar shall have an outside diameter a minimum of four inches greater than the outside diameter of the wall sleeve.

D. Approved Manufacturers:

1. Sleeves for pipes through walls and floors:
    a. Ductile Iron Water-Stop wall pipe.
    b. Or Approved Equivalent.
2. Bolted rubber annular seal:
    a. Link Seal manufactured by Thunderline Corp.
    b. Or Approved Equivalent.

2.08 ANCHORS

A. Hollow Concrete Block and Brick Anchors:

1. Acceptable Manufacturer and Type:
    a. HIT S 12/A Combi Fastener manufactured by Hilti Corporation.
    b. Approved Equivalent.
2. Accessories: HY20 Adhesive with screen tube insert.

B. Use Type 316 stainless steel epoxy adhesive anchor bolts, Hilti 150 injection adhesive anchors, or equal, for building or structure attachments. Provide continuous concrete inserts, Unistrut P3200 series, or equal, where applicable.

C. Mechanical anchor and powder-actuated drive-pin fasteners shall be used only with prior approval from the ENGINEER.

2.09 FABRICATION

A. Size sleeves large enough to allow for installation of annular seal.

B. Design hangers to support piping without disconnection of pipe.

2.10 FINISH

A. Factory coat steel hangers and supports as specified in Section 09 90 02 – Mechanical Painting and Coating.

B. Touch up finish on exposed steel hangers and supports in accordance with Section 09 90 02 – Mechanical Painting and Coating.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall verify location of piping and piping systems as shown on the Drawings.

B. Pipes shall be attached to structural members when possible. When necessary to frame structural members between existing members, such members shall be provided by the Contractor at no additional cost to OWNER. Structural members shall be in accordance

with the building code and the guidelines of the AISC.

C. Install hangers, supports, clamps, and attachments as required to properly support piping in all operating conditions, including thrust, water hammer and surge conditions. Supports shall allow for free expansion and contraction of the piping, and shall prevent stress on equipment. Hangers shall have a means of vertical adjustment after installation. Hangers shall be designed so that movement of the supported pipe cannot cause them to disengage. Hanger rods shall be subject to tensile loading, only.

D. No attempt has been made to show all required pipe supports in all locations, either on the Drawings or in the details. The absence of pipe supports on the Drawings shall not relieve the Contractor of the responsibility of providing supports as required.

E. Connections to structural framing shall not induction twisting, torsion, or later bending in the framing members. Provide supplementary steel as required.

F. Adjust support and hanger sizes to account for pipe insulation.

G. Meters, valves, equipment, and other point load items shall be independently supported to prevent pipe stress. Piping shall support no meters, valves, equipment or other point load items.

H. Space supports within maximum piping span length indicated in MSS SP-69, as indicated on the Drawings, or as recommended by the pipe manufacturer, whichever spacing is less. Install additional supports at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.

I. Supports, hangers, anchors, and guides shall be designed and provided to prevent excess heat transfer to the structure or equipment, where applicable.

J. Risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping, when possible.

K. Do not support piping with wire, either temporarily or permanently. Do not support piping from other piping.

L. Piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the support or the effects of the support.

M. Embedded pipe supports or inserts shall be in place prior to placement of cast-in- place concrete. Continuous inserts shall be furnished with end caps and cardboard closure strips. Locate and space building attachments so that the total load and the point loads due to the pipe hanger and supports do not exceed the design capacity of the supporting structure.

N. Where it is necessary to anchor supports to hardened concrete or completed masonry use stainless steel adhesive anchors.

O. For precast concrete slabs, drill through concrete slab from below and provide stainless steel through bolts with square steel plates and stainless steel bolts. Plate shall bear directly upon the top surface of the precast concrete slab. All toppings or insulation as required shall be applied after installation of all support plate assemblies.

P. Attach to structural steel with beam clamps.

Q. Mechanical anchor and powder-actuated drive-pin fasteners shall be installed in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Non-adhesive anchors shall be only used with prior approval from the ENGINEER.

R. Piping shall be supported at least one and one-half inch out from the face of walls and at least three inches below ceilings, unless otherwise noted.

S. Pedestal supports shall be used where indicated on the drawings or when piping is installed at or near the floor level, and shall consist of galvanized floor flange, pipe, and saddle. Provide stainless steel anchor bolts. All pedestal supports shall be adjustable, and place up off of the floor with minimum 1-inch grout.

3.02 INSERTS

A. Provide and install inserts for placement in concrete formwork.

B. Provide and install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams and walls.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

3.03 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX HANGER/ SUPPORT SPACING	MIN HANGER/SUPPORT ROD DIAMETER
½ to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	10'-0"	7/8"
14 to 18 inch	10'-0"	1"
20 to 30 inch	10'-0"	1-1/2"
30 to 36 inch	10'-0"	1-3/4"
PVC (All Sizes)	5'-0"	1/2"

B. Install supports free standing or suspended to provide minimum ½ inch space between support and adjacent Work.

C. Place a hanger/support within 12 inches of each horizontal fitting and on each side of valves.

D. Use hangers with 1½-inch minimum vertical adjustment.

E. Support riser piping independently of connected horizontal piping.

3.04 THRUST ANCHORS AND GUIDES

A. For suspended piping, center thrust anchors as closely as possible between expansion

joints and between elbows and expansion joints. Anchors shall hold pipe securely and shall be sufficiently rigid to force expansion and contraction movement to take place at expansion joints and/or elbows and to preclude separation of joints.

B. Provide thrust anchors as required to resist thrust due to changes in diameter or direction or dead end of pipelines. The design of all anchors shall be subject to approval by ENGINEER. Anchorage shall be required wherever bending stresses exceed allowable for pipe. Wall pipes may be used as thrust anchors.

C. Pipe guides shall be provided adjacent to sliding expansion joints in accordance with the recommendations of the National Association of Expansion Joint Manufacturers.

3.05 INSERTS AND ANCHORS

A. Furnish and install inserts or anchors for placement in concrete.

B. Furnish and install inserts or anchors for suspending hangers from reinforced. concrete slabs and sides of reinforced concrete beams and walls.

C. Utilize support assemblies designed for the appropriate loads. Contractor shall verify design conditions of each piping system.

D. Mechanical anchor and powder-actuated drive-pin fasteners shall be installed in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Non-adhesive anchors shall be only used with prior approval from the ENGINEER.

3.06 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floor three inches above finished floor level.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and sleeve with link seal.

D. Wall sleeves and wall pipes shall be securely supported by form work to prevent contact with reinforcing steel and tie wires. Sleeves shall be set in formwork prior to pouring concrete.

E. For precast concrete panels openings shall be provided of such size to allow at least three inches clearance around the outside of the sleeve. After installation of sleeve, grout shall be tamped into place making a watertight joint.

3.07 COATING

A. Prime coat non-galvanized steel or non-stainless steel hangers and supports.

B. Finish coat all hangers and supports, except galvanized and stainless steel hangers and supports, under provisions of Division 9.

END OF SECTION 40 27 05

SECTION 40 27 10
PROCESS PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Furnishing and installation of the following, as indicated, in accordance with the provision of the Contract Documents:

a. Couplings.

b. Flanged Coupling Adapters.

c. Quick Connect Couplings

d. Buried Flange Adapters.

e. Mechanical Joint Restraint Gland.

f. Filler Flanges.

g. Rubber Expansion Joints.

h. Flexible PVC Wire Reinforced Hose.

i. Wye Strainers.

j. Filters

k. Basket Strainers

l. Spray Nozzle Eductors

m. Fire Hose

n. Fire Hose Spray Nozzle

o. Rubber Garden Hose

B. Related Sections include:

1. Section 01 10 00 – Summary of Work.

2. Section 09 90 02 – High Performance Painting and Coating.

3. Section 40 27 00 – Process Piping - General.

4. Section 40 27 05 – Process Piping Support Systems.

5. Section 40 27 20 – Process Valves.

1.02 SUBMITTALS

A. Shop Drawings and Product Data: Submit, Under Provisions of Section 01 33 00, on all materials and products specified in this Section.

B. Provide a list of materials and corresponding suppliers.

C. Submit Affidavit of Compliance certifying that materials furnished have been tested and are in compliance with specification requirements.

PART 2 - PRODUCTS

2.01 SPECIALTIES CONNECTIONS

A. Provide pipe specialties suitable to connect to adjoining pipes as specified for pipe fittings. Diameter to match adjacent and adjoining piping.

2.02 WORKING PRESSURE

A. Working pressure of pipe specialties to be equal to working pressure of connecting pipes, unless specified otherwise.

2.03 APPROVED MANUFACTURERS

A. Mechanical Couplings
   1. Manufacturer and Type:
      a. Dresser “Style 38”.
      b. Smith-Blair “441 or 411 Flexible Coupling”.
      c. Romac “Style 501” Coupling.
      d. Or Equal.

B. Quick Connect Couplings
   1. Manufacturer and type:
      a. OPW, Kamlock.
      b. Ryan Herco, 1300 series.
      c. Or Equal.

C. Flanged Coupling Adapters
   1. Manufacturer and type:
      a. MegaFlange Series 2100 by EBAA Iron, Inc.
      b. Smith Blair 912
      c. Or Equal.

D. Tapping Saddles and Tapping Sleeves
   1. Mueller
   2. Or Equal.

E. Pipe Repair Clamps
   1. Mueller Series 510
   2. Or Equal.

F. Rubber Expansion Joints

1. Series 230, Style 231 with limit rods and compression sleeves by Proco Products, Inc.
2. Invincible Style 501 with control rod assembly by Mercer Rubber Co.
3. Or equal

G. Flexible PVC Wire Reinforcement Hose

1. Material: PVC Hose – Heavy Duty.
2. Reinforcement: Coated or Encased Spiral Wire.
3. Strength: Capable of holding 100 pounds without elongation.
4. Finish: Interior shall be smooth.
5. Size: As shown on the drawings.
6. Use: As shown on Drawings.
7. Manufacturer:
    a. Titan Hose.
    b. Or Equal.

H. Wye Strainers, Water Service, 2 inches and Smaller:

1. Type: Bronze body, Y-pattern, 200 psi nonshock rated, with screwed gasketed bronze cap.
2. Screen: Heavy-gauge Type 304 stainless steel or monel, 20-mesh.
3. Manufacturer:
    a. Armstrong International, Inc., Model F.
    b. Mueller Steam Specialty, Model 351M.
    c. Or Equal.

I. Filters *(if applicable)*

1. Type: Cartridge filter housing and disposable filter cartridges
2. Inlet Liquid Pressure: 50-80 PSI
3. Flow Rate: 20-150 GPM
4. Usage: Effluent reuse filter
5. Cartridge Pore Size: 150 micron
6. Spare parts: provide spare disposable filter cartridges
7. Manufacturer:
    a. Hayward

b. Dayton

c. Eaton

d. Or equal

J. Basket Strainers

1. Type: Basket Strainer
2. Inlet Liquid Pressure: 50-80 PSI
3. Flow Rate: 20-150 GPM
4. Screen: Type 304 stainless steel or monel, 80-mesh.
5. Usage: Effluent reuse strainer
6. Spare Parts: provide 2 baskets for each strainer
7. Manufacturer:
   a. Hayward
   b. Eaton
   c. Or equal

K. Spray Nozzle Eductors, Chlorine Injection *(if applicable)*

1. Type: Polypropylene
2. Inlet Connection: Pipe thread inlet 1.5 inches
3. Orifice Diameter: 9/16 inches
4. Inlet Liquid Pressure: 40 PSI
5. Inlet Flow Rate: 66 GPM
6. Entrained Flow Rate: 264 ±10% GPM
7. Circulation Rate: 330 ±10% GPM
8. Manufacturer:
   a. Spraying Systems Co.
   b. Or equal

L. Fire Hose *(if applicable)*

1. Type: Rubber covered lay flat
2. Size: 1.5 inches
3. Length: 50 ft
4. Bowl Size:1-13/16 inches
5. Inlet Liquid Pressure: 80 PSI

6. Quantity: 1
7. Manufacturer:
    a. Fire Hose Direct.
    b. Or equal

M. Fire Hose Spray Nozzle *(if applicable)*
1. Type: Assault fire hose nozzle with pistol grip
2. Inlet Connection: Pipe thread inlet 1.5 inches
3. Inlet Liquid Pressure: 80 PSI
4. Quantity: 1
5. Manufacturer:
    a. Akron Brass Co.
    b. Or equal

N. Rubber Garden Hose
1. Type: Commercial/Industrial rubber hose
2. Size: 5/8 inches
3. Length: 50 ft
4. Quantity: 1
5. Manufacturer:
    a. Apex Commercial Model 8695-50
    b. Or equal

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment in locations shown on the Drawings.

3.02 MECHANICAL COUPLINGS

A. A space of at least ¼-inch, but not more than 1-inch, shall be left between the pipe ends.

B. Pipe and coupling surfaces in contact with gaskets shall be clean and free of dirt and other foreign matter during assembly.

C. All assembly bolts shall be gradually tightened and at a uniform rate, so that the coupling is free from leaks and all parts of the coupling are square and symmetrical with the pipe.

D. The interior surfaces of the middle rings shall be prepared for coating in accordance with the instructions of the coating manufacturer and shall then be coated with liquid epoxy in

accordance with ANSI/AWWA C210. The remaining components shall be cleaned and shop primed with universal primer.

E. Repair and damaged areas of shop coatings on the pipe and coupling to the satisfaction of the Engineer.

F. Provide steel tie-bolts, diametrically opposite, which extend across the joint from lugs welded to the pipe on either side of the joint to provide restraint.

3.03 FLANGED COUPLING ADAPTERS

A. After the pipe is in place and bolted tight, the proper locations of holes for anchor studs or lock pins shall be determined and the pipe shall be field-drilled.

B. The inner surfaces of the couplings shall be prepared for coating in accordance with the instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining surfaces, except the flange mating surfaces, shall be cleaned and shop primed with universal primer.

3.04 FILLER FLANGES

A. Ductile iron conforming to the requirements of AWWA C115, maximum 250 psi working pressure.

B. Match filler flange to adjoining pipe working pressure class.

3.05 RUBBER EXPANSION JOINTS

A. Install expansion joints and control rod units per manufacturer’s recommendation.

END OF SECTION 40 27 10

SECTION 40 27 20
PROCESS VALVES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Furnishing and installation of the following (where applicable), in accordance with the provisions of the Contract Documents.

a. Actuators.
b. Plug Valves.
c. Check Valves.
d. Duckbill Check Valves.
e. Butterfly Valves.
f. Ball Valves.
g. Gate Valves.
h. Globe Valves.
i. Mud Valves.
j. Air Release Valves.
k. Pressure Reducing Valve.
l. Wye Strainers.
m. Corporation Stops.
n. Telescoping Valves

B. Related Sections include:

1. Section 01 33 00 – Submittal Procedures
2. Section 01 40 00 – Quality Control
3. Section 01 60 00 – Product Requirements
4. Section 01 77 00 –Closeout Procedures
5. Section 01 78 23 – Operations and Maintenance Data
6. Section 09 90 02 – High Performance Painting and Coating
7. Division 26 – Electrical
8. Section 40 27 00 – Process Piping - General
9. Section 40 27 15 – Process Piping Support Systems
10. Division 43 – Sewage Pumps/Pump Station

1.02 REFERENCES

A. Reference Standards include:

1. AWWA C504: Rubber-Seated Butterfly Valves.

2. AWWA C509: Resilient-Seated Gate Valves for Waterworks Service, 2 inches through 24 inches NPS.

3. AWWA C512: Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

4. AWWA C540: Power-Actuating Devices for Valves and Sluice Gates.
5. AWWA C550: Protective Epoxy Interior Coatings for Valves and Hydrants.
6. AWWA C800: Underground Service Line Valves and Fittings.

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit in accordance with Section 01 33 00, detailed specifications, drawings, and data covering all materials, parts, devices, equipment, and other accessories forming part of equipment for the complete operational system. Include name of Manufacturer, references, joint data, maximum loadings and thrust restraints.

B. Operations and Maintenance Data: Submit in accordance with Section 01 78 23 on all parts, devices, equipment and other accessories forming each complete operational system. Include a complete write-up of how the system is to operate and how to make adjustments.

1.04 REGULATORY REQUIREMENTS

A. All products that may come into contact with water intended for use in a public water system shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each product.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

B. Unless otherwise indicated, use valves suitable for 150 psi minimum working pressure.

2.02 VALVE CONNECTIONS

A. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use full port size valves.

B. Thread pipe sizes 1-1/2 inches and smaller unless indicated otherwise.

C. Flange pipe sizes 2 inches and larger unless indicated otherwise.

2.03 ACTUATORS

A. Manual Geared Actuators:

1. Type: Gear with cast iron housing. Provide chain-wheel on all valves with centerline located 6 feet and higher. Provide hand-wheel on all others requiring a manual operator.
2. Equip with adjustable open and closed position stops.
3. Provide manual gear/hand wheel actuator on all valves unless indicated otherwise on the Drawings or the valve schedule. The direction of rotation of the wheel, wrench

nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body shall have cast thereon the word “OPEN” and an arrow indicating the direction to open.

4. Provide riser stem and floor mounted base as indicated on the Drawings.
5. Provide position indicator.
6. Hand wheels:
    a. Hand wheels shall be cast iron.
    b. Maximum wheel diameter shall be 12 inches.
    c. Maximum hand wheel pull shall be 80 pounds.
7. Chain wheels:
    a. Chain wheels shall be galvanized, shrouded pocket hand wheels.
    b. Provide shearidized chains.
    c. Maximum wheel diameter shall be 12 inches.
    d. Bolt to hand wheel type chain wheels will not be acceptable.
    e. Maximum chain wheel pull shall be 80 pounds.
    f. Each chain wheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without "gagging" of the wheel and will also permit reasonable side pull on the chain. Suitable extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be looped to extend within 4 feet of the floor below the valve.
8. Hand Levers:
    a. Provide hand levers where indicated on the Drawings, or in these specifications.
    b. Hand levers shall be directly connected to the shaft and rotate 90 degrees from full closed to full open.
    c. Levers shall be provided with a locking device to assure positive position in full open, full closed and a minimum of five intermediate positions around the 90 degrees of rotation. Indication of valve position shall be provided.
    d. In any building or structure containing lever operated valves, at least two operating levers shall be provided for each size and type of lever operated valve.
9. Manual Nut Operators:
    a. Provide 2-inch AWWA-certified operating nut where indicated on the Drawings, or in these specifications.
10. The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided

inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

11. Manufacturers:
    a. Pratt.
    b. DeZurik.
    c. Clow

2.04 PLUG VALVES

A. Type of Valve: Eccentric plug valve.

B. Body: Flanged, ASTM A126, Class B cast iron body. Bolted bonnet. Flanged valve shall be fully faced and drilled in accordance with ANSI B16.1, Class 125.
    1. Exterior Coating: Red oxide primer. Finish coat per Section 09 90 02.
    2. Interior Coating: Epoxy suitable for potable water service or fully neoprene rubber lined.

C. Minimum Valve Classification:
    1. 12 Inch and Smaller: 175 psi, C.W.P., non-shock working pressure rating.
    2. When plug valve is in full open position, plug geometry and body waterway contours shall provide port area equal to 80 percent of the adjacent pipe nominal diameter and no cavities where debris can collect.
    3. All PLUG valves on a forcemain shall a rectangular port and be 100% port. The valve port area shall meet or exceed standard pipe area per ASME/ANSI B36.10M. Round ports are not acceptable.

D. Resilient Plug Facing: Neoprene. Provide dead-tight shutoff pressure in either direction.

E. Seat: One piece welded nickel, or AISI 304L Stainless Steel. The raised surface shall be completely covered with nickel to insure that the resilient plug face contacts only the nickel seat.

F. Stem Seal Packing: Nitrile-butadiene (Buna) filled PTFE U-ring seal or meet AWWA C504.

G. Bearings: Stainless steel, permanently lubricated radial bearings. Non- adjustable thrust bearings.

H. Manual Actuators:
    1. Type: Hand wheel, or gear with cast iron housing.
    2. Provide chain wheel on all valves located with centerline 6 feet and higher.

3. Equip with adjustable open memory stop.
4. Provide position indicator.

I. Buried Actuators

1. Actuators shall be 90% grease filled. Input shaft and fasteners shall be stainless steel. Actuator mounting brackets shall be totally enclosed.

J. Manufacturers:

1. DeZurik.
2. Pratt
3. Milliken.
4. Clow.
5. GA Industries.

2.05 CHECK VALVES

A. Check Valves:

1. Manufacturer and Type:
   a. Series 100SR Rubber Flapper Swing Check Valve by Apco.
   b. Surgebuster Swing Flex check Valve by Val-Matic.
   c. Milliken Flex Check.
   d. Crispin.
   e. GA Industries.
2. Design: Full body, flanged type, with removable cover for removal of rubber flap disc without removal of valve from process line.
   a. Body and Cover: Ductile Iron or Cast Iron, Grade B.
   b. Disc: Buna-N w/steel and fabric reinforcement.
   c. Interior and Exterior coating shall be fusion bonded epoxy.
   d. Exterior Hardware: Stainless steel bolts, nuts, and washers.
   e. Body Plug: Stainless steel
   f. Hold Open Device: Valve shall be supplied with hold open device and body plug.
3. The valve shall have full flow equal to the nominal pipe diameter at any point, through the valve. Disc stroke shall be 35 degrees. Top access port shall be full size.
4. Provide a disc accelerator or spring return for rapid closure.
5. Provide a screw type backflow actuator to allow opening of the valve during no flow conditions.

6. Refer to Drawings and Valve Schedule for installation locations and sizes.

2.06 BUTTERFLY VALVES – SERVICE TYPE: LIQUID

A. Standard: AWWA C-504, Standard for Rubber Seated Butterfly Valves.

B. Type of Body: Flanged short body. Flanged valves shall be fully faced and drilled in accordance with ANSI Standard B16.1, Class 125.

C. Minimum Valve Classification: 150B.

D. Shaft: One piece Type 304 stainless steel and supported on Teflon coated stainless steel or inert nylon bearings.

E. Shaft Seal: Self-adjusting Chevron "V"-type.

F. Body: ASTM A126, Class B cast iron. Body wall thickness shall meet AWWA C504. Coated or plated disks are not acceptable.

G. Seats: Acrylonitrile-butadiene material. One-piece construction and attached to valve body or disc.

H. Disc: One piece design. ASTM A126, stainless steel. Shaft shall pass through disc. Disc shall be retained by stainless steel pins or bolts that shall extend through the full diameter of the shaft. Disc stops within the flow stream shall be rejected.

I. Approved Manufacturer:

1. Pratt.
2. DeZurik.
3. Milliken.
4. American R/D.
5. GA Industries.

2.07 BUTTERFLY VALVES – SERVICE TYPE: AIR

A. Low Pressure Air Service Butterfly Valve (2" to 48")

1. Service:
    a. Low Pressure Air (<20 psi)
    b. Temperatures to 250 degrees F
    c. Modulating or Open/Close function
2. Features:
    a. General:
        i. High Performance Butterfly Valve
        ii. Pressure Rating: ANSI Class 150 (285 psi), drop tight
    b. Body:

i. Full lug style, designed to fit between ANSI B 16.5 Class 150 flanges, suitable for dead-end service in either direction.

ii. Carbon steel (ASTM A216 WCB) with baked on epoxy powder coating.

c. Disc:

i. 316 stainless steel (ASTM A351-CF8M)

ii. Provide valve with double-offset disc design with 2-piece stem to provide uninterrupted 360-degree seating.

d. Shaft:

i. Two-piece.

ii. 17-4 stainless steel.

e. Seat:

i. Valve seat shall be retained in the valve body and replaceable without removing disc or stem.

ii. RTFE/stainless steel

3. Manufacturers and Products:

a. Henry Pratt Company: Series 400

b. Tyco/Keystone; Figure F362, Trim Code 123

c. Or equal

2.08 BALL VALVES

A. Manual ball valves for use with metallic pipe systems:

1. Manufacturer and type: Series B-6000 ball valve as manufactured by Watts Regulator Company, or approved equivalent.

a. Body: Bronze.

b. Ball: AISI Stainless Steel.

c. Stem: AISI Stainless Steel.

d. Valve Seats: Durafill.

e. Connection: Threaded.

B. Manual ball valves for use with PVC pipe systems:

1. Manufacturer and type:

a. Watts Regulator Company.

b. Hayward.

c. Spears.

d. George Fisher Inc (GF).

2. Material: PVC.
3. Seats: Teflon.
4. Seals: Viton “O” rings.
5. Stem: Blow out proof.
6. Connector: True union.

2.09 GATE VALVES

A. Approved Manufacturer:
   1. DeZurik.
   2. Mueller.
   3. Clow
   4. Approved Equivalent.

B. Gate valves 2-inches to 48-inches in diameter shall be resilient wedge type gate valves rated for 250 psi working pressure with all ferrous components ductile iron in accordance with ASTM A536. Gate valves 3-inches to 36-inches in diameter shall be in full compliance with the requirements of AWWA C515.

C. Manufacturer shall provide an affidavit stating that the valve and materials conform to the applicable AWWA requirement and test specified under the respective standard have been performed and met. Valves shall be NSF 61 certified.

D. The wedge shall be cast or ductile iron encapsulated with polyurethane rubber. The polyurethane shall be permanently bonded to the wedge.

E. The interior of the body and bonnet shall be coated with a fused epoxy coating meeting the requirements of AWWA C550.

F. Valves shall be non-rising stem with a 2-inch square operating nut, unless noted otherwise. All valves shall open right unless noted otherwise.

G. Stems shall be cast bronze with integral thrust collars. The stuffing box shall be the P-ring seal type with a triple O-ring seal. The rings shall be replaceable with the valve fully open at full rated working pressure.

H. There shall be two (2) low torque thrust washers or bearings located above and below the integral stem collar. The stem nut shall be separate and shall be of solid bronze or copper alloy.

I. Markings shall be cast on the bonnet or body of each valve and shall show the manufacturer’s name, year valve casting was made, size of valve, the letters and numbers “C515”, and the designated working water pressure.

J. Valves shall be equipped with indicators to show the position of the gate in relation to the water way.

K. Valves shall be suitable for exposed service. All nuts, bolts, and hardware shall be

stainless steel.

1. Provide geared operators, unless noted otherwise. Gears shall be steel, housed in a heavy-duty cast iron grease case.

2.10 AIR RELEASE VALVES (ARV)

A. Air release valves shall allow entrained air in pipelines to escape through an air release orifice. After releasing entrained air, the orifice shall close by a needle mounted upon a compound lever mechanism actuated by a float. The orifice shall remain closed until more air accumulates and the cycle is repeated.

B. Valves for sewage or sludge shall contain flushing and drain connections.

C. Acceptable Manufacturers:

1. Water Valves:

a. Apco

b. Crispin

c. Val-Matic

d. GA Industries.

2. Sewage or Sludge Valves

a. Apco

b. Crispin

c. Val-Matic

d. GA Industries.

2.11 PRESSURE REDUCING VALVE

A. Valve Operation: Valve shall automatically reduce higher inlet pressure to a steady lower pressure downstream regardless of changing flow rate or varying inlet pressure. The valve shall be pilot operated capable of holding pressure to a predetermined limit. The main valve and pilot valve shall close drip-tight if the downstream pressure exceeds the pressure setting of the control pilot. A check feature shall be provided. Should a pressure reversal occur, the downstream pressure shall be admitted in the main valve cover chamber closing the valve to prevent return flow.

B. Refer to Valve Schedule in the Drawings for installation locations and sizes.

C. Adjustment Range: 15 to 150 psi.

D. Temperature Range: Water to 180 degrees F.

E. Main Valve Materials:

1. Body and Cover: Cast Iron; 125-pound flanges.

2. Disk Retainer & Diaphragm Washer: Cast Iron.

3. Trim (Disc guide, seat, and cover bearing): Bronze.
4. Disc: Buna N Rubber.
5. Diaphragm: Nylon reinforced Buna N.
6. Stem, Nut, and Spring: Stainless Steel.

F. Pilot System Materials:
1. Pilot Control: Bronze.
2. Trim: Stainless Steel Type 303.
3. Rubber: Buna N Synthetic Rubber.

G. Acceptable Manufacturer:
1. Cla-Val.
2. Singer Valve Company.
3. Ross Valve.
4. GA Industries
5. Or Equal

2.12 PRESSURE REDUCING VALVE – CHEMICAL FEED TYPE

A. Operation: Valve shall automatically reduce higher inlet pressure to a steady lower pressure downstream regardless of changing flow rate or varying inlet pressure.

B. Material: all thermoplastic diaphragm Pressure Relief Valve for protecting against over-pressure in chemical feed systems. Valves shall be capable of reducing pressure to the following range with adjustable spring: 10 – 150 psi
1. BODY: PVC, CPVC, PP, or PVDF
2. DOME: Molded NORYL™
3. Adjustment screw with slot.
4. 304 stainless steel bolting
5. PTFE/EPDM Diagram
6. FNTP Threads

C. MANUFACTURERS;
1. Hayward Flow Control
2. Or Equal

2.13 CORPORATION STOPS

A. Bronze, Brass, or Stainless steel construction, inlet and outlet openings same size as the valve.

B. AWWA ball valve type.

C. Insta-tite or compression connections.

D. Meet or exceed the ANSI/AWWA C800 standards, 150 psi.

E. Approved Manufacturers:

1. A.Y. McDonald Manufacturing.
2. Mueller
3. Fork Meter Box
4. Or Approved Equivalent.

2.14 TELESCOPING VALVES

A. The manufacturer shall have experience 10 years manufacturing telescoping valves and shall show evidence of satisfactory operation in at least 5 installations. The manufacturer's shop welds, welding procedures, and welders shall be qualified and certified in accordance with the requirement of the latest edition ASME, Section IX. The manufacturer must also be an ISO 9001 certified company.

B. General Design

1. Slip Tube
   a. Slip tube material shall be type 304 or 316 stainless steel;
   b. The slip tube may be supplied square on top or with a V-notch for estimating flow.
   c. Cone weirs and/or Scum baffles shall be stainless steel (304 or 316) when required.
2. Grease Fitting
   a. When required, slip tubes shall be equipped with a grease fitting to allow the operator to apply grease to the slip tube from the operator level. The fitting shall be used when flange is often exposed to dry air, or in a dry application completely.
3. Flange
   a. The slip tube gasket shall be BUNA-N and replaceable without removal of the slip tube assembly from the riser pipe, lift rod or actuator. The gasket retainer shall be stainless steel and the flange shall be cast iron, unless otherwise specified.
4. Safety Lock Operators **(operator can be either rising or non-rising stem – rack & pinion or screw type);**
   a. Rack & Pinion
      i. The operator shall be rising stem, rack and pinion type, with a worm gear operator and bronze bearings. For safety and efficiency, the operator shall be self-locking, eliminating the need for additional locking devices. A clear

acrylic rack cover with a calibrated Mylar strip position indicator shall be provided.

b. Screw Type Rising Stem

i. The operator shall be screw type with a stainless steel acme thread screw. A clear acryic rack cover with a calibrated Mylar strip position indicator shall be provided.

c. Non-Rising Stem

i. The operator shall be a non-rising stem style with a hand wheel and linear position indicator, calibrated in 1/4" increments, incorporated in the stainless steel floor stand. A stainless steel traveling torque tube and stainless steel anti-rotation plate shall be incorporated to prevent the slip tube from rotating. All fasteners are to be 304 stainless steel.

d. The telescoping valve shall be machined, assembled, and tested in the USA for quality assurance.

Manufacturer shall show proof of ISO 9001 certification.

e. Where required, the manufacturer shall provide valve operating stems, stem guides, and operators as specified in the valve schedule or plans.

f. Telescoping Valve and accessories shall be manufactured by Troy Valve or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted (does not apply to plug valves).

B. Install valves in the locations and configurations shown on Drawings.

C. Provide adequate structural support of installed valves as required.

D. Install valves per manufacturer's recommendations.

E. Install telescoping valves plumb and in accordance with manufacturer's guidelines.

3.02 STARTING AND ADJUSTING

A. Furnish Owner and Engineer with a written report prepared by equipment supplier certifying that equipment:

1. Has been properly installed.
2. Is in accurate alignment.
3. Is free from an undue stress imposed by connecting piping, anchor bolts, etc.
4. Has been operated through at least two complete open/close cycles.
5. Checked for leakage

3.03 CLASSROOM AND DEMONSTRATION TRAINING

A. Provide minimum two (2) hours classroom and demonstration training on the proper operation and maintenance of equipment. Training to be completed after completion of starting and adjusting.

3.04 PAINTING

A. All material and equipment in this section shall be factory primed. Primer shall be compatible with finish coats of paint provided under Section 09 90 02 – Mechanical Painting and Coating.

B. Finish painting of all materials and equipment in this Section that are not concealed shall be the responsibility of the General Contractor, and shall be as described in Section 09 90 02 – High Performance Painting and Coating, unless otherwise specifically indicated. The Contractor shall, however, refinish and restore to the original appearance, all equipment that has sustained damage to the manufacturer's finish or prime coats of paint or enamel.

END OF SECTION 40 27 20

SECTION 40 27 60
PROCESS IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Pipe markers.
2. Equipment, valve, gate, flow meter, and instrument markers.
3. The methods and materials specified herein apply to all piping and equipment in Divisions 40 and Division 46.

B. Related Sections include:

1. Section 01 33 00 – Submittals.
2. Section 09 90 02 – High Performance Painting and Coating.
3. Division 23 – HVAC
4. Division 26 – Electrical
5. Division 46 – Equipment

1.02 REFERENCES

A. Reference Standards include:

1. Ten States Standards - 2.14 Piping Color Code.
2. ANSI A13.1 - 1981: Schemes for Identification of Piping Systems.

1.03 SUBMITTALS

A. Submit color schedule under provisions of Section 01 33 00.

B. Submit location drawing and shop drawings on markers under provisions of Section 01 33 00.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Pipe Marker Manufacturers:

1. W.H. Brady Co.
2. Seton Nameplate Corp.
3. Chemelex Div., Raychem Corp.
4. Koibi Industries, Inc.
5. John P. Nissen Jr. Co.
6. Zippertubing Co.

7. Emedco.

2.02 PIPE MARKERS

A. All pipes, regardless of material, shall receive pipe markers.

B. All process and drainage piping within the Lift Station Building, and Package Plant Containers regardless of content, shall have labels every ten feet with a minimum of two labels in each room, closet, or pipe-chase.

C. Pipe Size ¾ inch through 6 inch Diameter:

1. One piece, snap around and completely encircle pipe with substantial overlap and permanent tension to grip pipe firmly without adhesives.
2. Provide with flow arrows every 10'.
3. Clearly indicate pipe size and service code on line.
   a. Example: 4-WAS
4. Size of Legend Letters and Numbers:

Outside Diameter of Pipe or Pipe Covering	Size of Legend Letters and Numerals
3/4" to 1-1/4"	1/2"
1-1/2" to 2"	3/4"
2-1/2" to 6"	1-1/4"

5. Comply with ANSI Standard A13.1 – 1996.
6. Material: Pre-formed acrylic/vinyl plastic.
7. Working printed in a "repeat and reverse" pattern.
8. Adhesive markers **WILL NOT BE ALLOWED**.

D. Pipe Size 8 inch Diameter and Larger:

1. After process pipe has been finish coated per Section 09 90 02 – Mechanical Painting and Coating, apply pipe name with painted on stenciling.
2. Clearly indicate pipe size and service code in stencil.
   a. Example: 8-RAS
3. Provide each label with flow arrow adjacent to text.
4. Size of Legend Letters and Numbers:

Outside Diameter of Pipe or Pipe Covering	Size of Legend Letters and Numerals
8" to 10"	2"
Over 10"	3"

5. Paint on each pipe at 120 or 180 degree intervals based on pipe size and location. Arrange so labeling of similar pipe runs are spaced and oriented the same. Coordinate label placement with Owner and Engineer.
6. Stack stencil wording were applicable. Center flow arrow between words in vertical direction.
7. Coordinate and maintain consistent spacing and stencil locations from filter to filter, between flanges, and within plant walls and penetrations for neat appearance.
8. Stencil paint color to be selected by Engineer to provide required contrast between process pipe coating and stencil identification.
9. Adhesive markers **WILL NOT BE ALLOWED**.

2.03 CONTROL DEVICE MARKERS

A. After process pipe, equipment, valves, flow meters, and other appurtenances have been finish coated per Section 09 90 02 – Mechanical Painting and Coating, apply metal nametag for all pieces of equipment, valves, gates, flow meters, and instruments.

1. Metal tag shall include the full tag including building following the examples below:

a.	Equipment:	AGS-BLW#1
b.	Valves / Gates:	WAS-AGS#1
c.	Instrument:	UVI-FE1

B. Material: Stainless Steel.

C. Size: 3 inch diameter, round shape, 0.025-inch thickness

D. Provide with holes for hanging.

E. Stamp tag with appropriate name or number. See the equipment schedule, valve schedule, and instrument schedule in the construction drawings for equipment, valves, flow meters, gates, and instruments.

F. Provide metal tags as required. Contractor shall verify number of valves, flow meters, equipment, and instruments requiring tags.

2.04 RFID TAGS

A. All equipment, valves, gates, flow meters, and instruments shall also receive RFID tags which shall allow operators to look up asset information in the field and linked to the facility asset management system. Contractor shall provide tags and coordinate integration with facility asset management system.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All process piping 1/2” or greater shall be scheduled for painting and identification. Marker colors shall be yellow with black lettering unless indicated otherwise.

B. Pipe Markers:

1. Install on all piping systems at the following locations or at Engineer's direction:
    a. Adjacent to each valve.
    b. Each branch and riser at take-off.
    c. At each pipe passage through wall or floor.
    d. At not more than 20 feet spacing on straight pipe runs.
    e. At each change in direction.
2. Provide number and copy indicated in schedule below.

C. Painting:
1. Finish painting of all materials and equipment shall be the responsibility of the General Contractor, and shall be as described in Section 09 90 02 – High Performance Painting and Coating.
2. Colors: As indicated in schedule below and coordinated with Engineer.
    a. Owner and Engineer reserve the right to change color selections during shop drawing review based on available color chart options. Where applicable, Contractor shall field verify and match existing pipe colors.
3. All PVC carrier piping shall be painted according to chemical tubing carried.
4. Provide 2-inch bands at 30 inch intervals where banding is required. Provide 2-inch width with straight edges and neat appearance. Contractor also has the option to use colored electric tape for identification banding in lieu of painting bands.

D. Control Device Markers
1. Attach with a corrosion resistant material.
2. Attach at all process valves, flow meters, equipment, pressure transducers, and ultrasonic level transducers.

3.02 PIPE COLOR CODE SCHEDULE

Wastewater and Chemical Lines:

Type of Line	Color	Tnemec Color / Band Color
Raw Influent (INF)	Dark Grey	34GR Deep Space
Treated/Settled Wastewater (TWW)	Light Grey	38GR Dove Grey
Potable (POT)	Dark Blue	11SF Safety Blue
Plant Water/Non-Potable (NPW)	Violet	16SF Rec Water Purple
Fire Protection	Red	06SF Safety Red
Plant Effluent (EFF)	Clay	07RD Terra Cotta
Chlorine (CL)	Yellow	02SF Safety Yellow
Polymer	Orange with Green Band	04SF Safety Orange 09SF Safety Green

Gas Lines:

Natural Gas (GAS/G)	Yellow	02SF Safety Yellow

Other:

• Compressed Air (AIR)	Dark Green	91GN Balsam
• Fire Protection	Red	06SF Safety Red
• Hoists/Trolleys	Yellow	02SF Safety Yellow

Contractor shall confirm all color selections for piping with Engineer.

END OF SECTION 40 27 60

SECTION 40 42 13
INSULATION FOR EXPOSED PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies thermal and sound insulation for exposed piping, related equipment and appurtenant surfaces.

B. Related Sections: Not used.

C. Performance Requirements:

1. Temperature Classes:

a. Insulation for exposed piping and equipment is classified for the following temperature ranges: low, medium; high, and very high.

b. Low temperature class insulation shall be suitable for an operating temperature range of -100 to +100 degrees F.

c. Medium temperature class insulation shall be suitable for an operating temperature range of l00 to 800 degrees F.

d. High temperature class insulation shall be suitable for an operating temperature range of 800 to 1200 degrees F.

e. Very high temperature class insulation shall be suitable for an operating temperature range of 1200 to 1800 degrees F.

2. Service Classes:

a. Insulation of exposed piping is provided for one or more of the following services: condensate control (CC), personal protection (PP), freeze protection (FP), and energy conservation (EC). All piping systems listed in the Insulation Thickness Schedule at the end of this section shall be insulated for the insulation service class listed in the schedule.

b. Pipe insulation for CC shall be provided for all piping and appurtenances that are designated as system CC and are 3 inches and smaller.

c. Pipe insulation for PP shall be provided on all equipment and piping and piping appurtenances

i. on the blower discharge piping that is within 8 feet of a floor slab, stair landing, or other type of accessible walkway and are contained within the facility structure where the equipment is located.

d. Pipe insulation for EC shall be provided on all piping and pipe appurtenances that are designated as EC.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revisions of the

following documents. They are part of this Section. In case of conflict between the requirements of this Section and the listed documents, the Contractor shall point out the conflict to the Project Representative; lacking a definitive answer otherwise, the requirements of the Contract Specifications shall prevail.

Reference	Title
ASTM 8209	Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534	Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C552	Cellular Glass Thermal Insulation
ASTM E96	Water Vapor Transmission of Materials
FEDSPEC L-P-535E Chloride)	Plastic Sheet (Sheeting) "Plastic Strip" Poly (Vinyl and Poly (Vinyl Chloride-Vinyl Acetate), Rigid
FEDSPEC HH-l-558B(3)	Insulation, Blocks, Boards, Blankets, Felt Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)

1.03 SUBMITTALS

A. Procedures: Section 01 33 00.

B. Items to be Submitted for this Specification:

1. Manufacturer's descriptive literature, including insulation and jacket thickness, heat transfer coefficient, and methods of installation.

2. Samples of each insulation material type and thickness along with typical jackets and covers for fittings, valves and appurtenances. Provide a 6 inch long, full diameter segment for each insulation sample.

3. Certification of jacket ratings for water vapor transmission and puncture and stiffness as specified.

1.04 WARRANTY

A. For the work of this Section, provide all warranties as described in the General Conditions,

Section 01 70 00, and provide all normal commercial warranties available as described in the General Conditions.

PART 2 - PRODUCTS

2.01 GENERAL

A. Piping insulation shall be tubular type or the flexible blanket type.

B. Insulation for valves, strainers, fittings, expansion joints, flanges and other

connections shall be segmented sections, molded, or blanket type coverings of the specified type and thickness of pipe insulation, or the flexible blanket type.

C. Equipment insulation shall be flexible blanket type or rigid board type cut to fit the surface.

2.02 INSULATION

A. General:

1. Low temperature class insulation shall be of the unicellular elastomeric thermal, cellular glass, or fiberglass type.

2. Medium temperature class insulation shall be of the cellular glass or fiberglass type.

3. High temperature class and very high temperature class insulation shall be of the calcium silicate type or the flexible blanket type. Piping and equipment subjected to vibration (such as engine exhaust) shall be insulated with flexible blanket type.

B. Unicellular Elastomeric Thermal Type: Unicellular elastomeric thermal type insulation shall conform to the requirements of ASTM C534, Type I.

C. Cellular Glass Type: Cellular glass type insulation shall conform to the requirements of ASTM C552, Type II.

D. Fiberglass Type: Fiberglass type insulation shall conform to the requirements of FEDSPEC HH-15588.

1. Shall be in compliance with ASTM C547, ASTM C1136, ASTM C795.

2. Shall be equal to or exceed the qualities of Owens-Corning SSL II

E. Calcium Silicate Type: Calcium silicate type insulation shall conform to the requirements of ASTM C533, Type II, Class C.

F. Flexible Blanket Type:

1. High Temperature Class:

a. High temperature insulation shall be removable 1- or 2-inch-thick blanket-type insulation designed for continuous 1200 degree F service.

b. The blanket shall be a custom sewn, flexible, reusable jacket, custom designed to closely fit the piping or the equipment housing.

c. Blanket shall be custom fitted to not restrict access to any instrumentation or equipment.

d. Insulation shall not compact or shake down in vibrating service.

e. Blanket insulation shall consist of a noncombustible silica cloth jacket and nonasbestos white ceramic fiber insulation.

f. Acceptable manufacturer:

i. Thermazip Hi-Temp blanket Style 2000-60-3000 by Accessible Products Company.

ii. Hitco AIM.

iii. Advanced Thermal Products.

iv. SEI Temp-Set 1200.

v. Approved equal.

2. Very High Temperature Class:

a. Very high temperature insulation shall be removable 1- or 2-inch-thick blanket-type insulation designed for continuous 1800 degree F service.

b. The blanket shall be a custom sewn, flexible, reusable jacket, custom designed to closely fit the piping or the equipment housing.

c. Blanket shall be custom-fitted to not restrict access to any instrumentation or equipment.

d. Insulation shall not compact or shake down in vibrating service.

e. Blanket insulation shall consist of a noncombustible silica cloth jacket and high purity alumina and silica nonasbestos white ceramic fiber insulation.

f. Acceptable manufacturer:

i. Thermazip Hi-Temp blanket Style 2000-61-3000 by Accessible Products Company.

G. Mandrel-Wound Pipe Section Type:

1. Shall comply with the properties outlined in ASTM C547

2. The insulative and durability properties shall equate to or exceed those of:

a. Rockwool ProRox PS 960 or;

H. *Blower discharge piping shall be insulated with either mandrel-wound as outlined in 2.02.G or Fiberglass as outlined in 2.02.D above*.

2.03 INSULATION JACKETS

A. Laminated Jackets: Laminated jackets shall consist of aluminum and white kraft paper. Jackets shall have a perm rating for water vapor transmission of not more than 0.02 in accordance with procedure A of ASTM E96.

B. Aluminum Jackets:

1. Aluminum jackets shall be constructed of smooth finish aluminum sheet conforming to ASTM B209, alloy 5005, temper H16, with integral vapor barrier. Jackets shall be 0.016 inch thick.

2. Sheet metal screws shall be aluminum or stainless steel.

3. Jackets shall be secured with 0.020 by 3/4-inch Type 304 stainless steel expansion

bands.

2.04 INSULATION COVERS

A. Polyvinyl Chloride (PVC) Covers: Polyvinyl chloride covers shall be one piece, premolded polyvinyl chloride conforming to FEDSPEC L-P-535E, Composition A, Type II, Grade E4.

B. Aluminum Covers: Aluminum covers shall be constructed of smooth finish aluminum sheet conforming to ASTM B209, alloy 5005, temper H16, with integral vapor barrier. Covers shall be 0.016 inch thick. *All insulated aeration blower* ***discharge*** *piping shall be provided with aluminum covers.*

C. Soft Covers: Soft covers shall be of the reusable type with TFE-coated fiberglass covers and liner.

2.05 SHIELDS

A. Unless otherwise indicated, thermal pipe hanger shields shall be provided at pipe supports. Thermal hanger shields shall be as specified in Section 40 27 05.

2.06 FLASHING

A. Flashing shall include aluminum caps, sealant and reinforcing. Aluminum caps shall be 20 gage thick and shall be cut to completely cover the insulation. Sealants shall be as recommended by the insulation manufacturer.

B. Reinforcement in flashing heated up to 370 degrees F shall be nylon fabric. Reinforcement in flashing for hotter surfaces shall be wire mesh or as recommended by the insulation manufacturer.

2.07 ADHESIVES

A. Adhesive products used for the work of this Section shall conform to the manufacturer's specifications for each particular pipe insulation system.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Apply insulation over clean, dry surfaces. Double layer ·insulation, where specified or required to achieve the specified surface temperature, shall be provided with staggered section joints.

B. Pipe Supports and Shields: Unless otherwise indicated, the Contractor shall supply thermal pipe hanger shields and install them during pipe support installation. Where thermal pipe hanger shields are used, apply the following to all butt joints:

1. On hot pipe systems, apply 3-inch-wide vapor barrier tape or band over the butt joints.

2. On cold water, chilled water, or refrigerant piping, apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with a minimum 3-inch-Wide vapor barrier tape or band.

C. Protection: Protect insulation and jackets from crushing, denting, and similar damage during construction. Vapor barriers shall not be penetrated or otherwise damaged. Remove any insulation, jacket, and vapor barriers damaged during construction and install new material.

D. Piping Insulation:

1. General

a. Pipe:

i. Insulate piping continuously along its entire length including all in-line devices such as valves, fittings, flanges, couplings, strainers and other piping appurtenances. Unless otherwise indicated, provide piping insulation with laminated jackets as specified within this Section. Insulation shall be butted firmly together and jacket laps and joint strips provided with lap adhesive. Install jackets with their seams located on the underside of pipe.

ii. Do not use PVC covers specified in this Section with medium-, high-, or very high- temperature class insulation. Removable flexible blanket-type insulation need not be jacketed.

b. Fittings, Connections, Flanges and Valves: Provide fitting, connection, flange and valve insulation with covers as specified within this Section. Secure insulation in place with 20-gage wire and a coat of insulating cement'. Covers shall overlap the adjoining pipe insulation and jackets. Install covers with_their seams located on the underside of fittings and valves.

2. Low Temperature Class:

a. Pipe: Seal off ends of insulation with a vapor barrier coating.

b. Fittings, Connections, Flanges and Valves:

i. Except where soft covers are specified, provide insulation for pipe sizes 2 inches and less with rigid PVC covers as specified within this Section. Seal covers at edges with vapor barrier adhesive. Secure the ends of covers with vinyl tape. The tape shall overlap the jacket and the cover at least 1 inch. Do not penetrate vapor barrier.

ii. Except where soft covers are specified, provide insulation for pipes 2-1/2 inches and larger with rigid aluminum covers as specified within this Section. Mechanically secure covers using corrosion-resistant tacks pushed into the overlapping throat joint.

3. Medium, High, and Very High Temperature Class:

a. Pipe: Except for flexible blanket type insulation, seal ends of insulation with end joint strips and use waterproof adhesive to hold them in place.

b. Fittings, Connections, Flanges and Valves: Except where soft covers are

specified, provide rigid insulation with rigid aluminum covers as specified within this Section. Mechanically secure covers using corrosion-resistant tacks pushed into the overlapping throat joint.

4. Outdoor Piping:

   a. Pipe: Provide rigid insulation with aluminum jackets as specified within this Section. Design flexible blanket-type insulation for outdoor, weather-exposed service. Where piping emerges from soil without concrete or asphalt overtop, extend the insulation a minimum of 12 inches below the finished ground level. Where piping emerges from concrete or asphalt, extend the insulation to within 1 inch of the finished surface. Do not push insulation into contact with the finished concrete or asphalt surface.

   b. Insulation Over Heat Tracing: Provide heat tracing in specified locations where indicated on the drawings (if applicable), in particular on back flow preventer valves for potable and fire water services that are located in insulated fiberglass vaults. Do not install insulation over the top of any piping that is heat traced inside these vaults. For all other piping, install insulation over the top of heat tracing according to the specifications of the heat trace tape and insulation manufacturers.

   c. Fittings, Connections, Flanges and Valves: Provide rigid insulation with rigid aluminum covers as specified within this Section. Design flexible blanket type insulation for outdoor, weather- exposed service.

E. Mechanical Equipment Insulation:

1. General:

   a. Unless otherwise specified, fit insulation to the contours of equipment and secure it with 1/2-inch by 0.015-inch galvanized steel bands. Weld pins or stick clips with washers may be used for flat surfaces and spaced a maximum 18 inches apart. Stagger joints and fill voids with insulating cement. Unless otherwise specified, provide insulation with laminated jackets as specified within this Section.

   b. Unless specifically specified to be uninsulated, insulate all equipment connected to insulated piping.

2. Outdoor Equipment: Provided insulation with a coat of weatherproof mastic and a layer of open- weave glass cloth embedded into a wet tack coat. Overlap seams at least 2 inches. Provide a finish coat of weatherproof mastic. The total coating thickness shall be a minimum of 1/8 inch.

3. Low Temperature Class:

   a. Where joints, breaks, and punctures occur in the insulation, seal them in facing with fire- retardant vapor barrier adhesive reinforced with 4-inch tape.

b. Provide insulation with a layer of open-weave glass cloth embedded into a wet coat of fire- retardant adhesive. Overlap seams at least 2 inches. Provide a finish coat of fire-retardant adhesive.

4. Medium Temperature Class: Cover joints and cement them in place with 4-inch-wide strips of the same material as the laminated jackets as specified within this Section.

5. High and Very High Temperature Class: Cover high and very high temperature equipment with custom-fitted removable blanket-type insulation or hinged sleeve insulation with protective jacketing. Secure blanket-type insulation with stainless steel wire lacing and hooks. Overlap ends of blanket segments to prevent gaps and voids when the piping and equipment are heated. Secure blankets snugly under nuts and bolt heads to assure complete coverage during operation and to prevent vibration-induced gaps or voids. Secure blankets in strict accordance with the manufacturer's instructions.

F. Flashing:

1. Provide flashing at jacket penetrations and terminations. Provide clearance for flashing between insulation system and piping supports.

2. Trowel a heavy tack coat of sealant over the insulation, extending it over the jacket edge 1 inch and over the pipe or protrusion 2 inches. Stretch reinforcement over the tack coat after clipping to fit over pipe and jacket. Strap clipped reinforcing with a continuous band of reinforcing to prevent curling. Then trowel sealant over the reinforcement to a minimum thickness of 1/8 inch.

3. Form aluminum caps to fit over the adjacent jacketing and to completely cover coated insulation. Hold cap in place with a jacket strap.

3.02 INSULATION THICKNESS SCHEDULE

A. The insulation dimensional tolerances shall comply with the specified standards. Equipment insulation shall match thickness of attached piping. The minimum insulation thicknesses, exclusive of jacket, shall be as shown in the schedule at the end of this section.

3.03 TESTING

A. In addition to any testing herein, perform all testing for this product or system consistent with the requirements of Section 01660, the applicable codes, and the manufacturers' current quality assurance program.

Insulation Thickness Schedule

Piping Service	Service Type	Temperature Class	Pipe
Blower Discharge Piping	PP	High	1" thick insulation

END OF SECTION 40 42 13

SECTION 40 42 80
PROCESS PIPING LEAKAGE TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Performing of the following, as indicated, in accordance with the provision of the Contract Documents:

a. Leakage testing of process piping.

B. Related Sections include:

1. Section 01 33 00 – Submittals.
2. Section 01 40 00 – Quality Control.
3. Section 01 60 00 – Product Requirements.
4. Section 01 75 00 – Starting and Adjusting.
5. Section 01 77 00 – Closeout Procedures.
6. Section 01 78 23 – Operations and Maintenance Data.
7. Section 40 27 00 – Process Piping.
8. Section 40 27 05 – Process Piping Support Systems.
9. Section 40 27 20 – Process Valves.

1.02 SUBMITTALS

A. Informational Submittals:

1. Testing Plan: Submit prior to testing and include at least the information that follows.

a. Testing dates.

b. Piping systems and section(s) to be tested.

c. Test type.

d. Method of isolation.

e. Calculation of maximum allowable leakage for piping section(s) to be tested.

2. Certifications of Calibration: Testing equipment.

3. Certified test report.

1.03 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Chlorine Institute (2001 L Street N.W., Washington D.C. 28036): Pamphlet 6, Piping

Systems for Dry Chlorine.

2. AWWA C600-99.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Notify Engineer in writing 5 days in advance of testing. Perform testing in presence of Engineer.

B. Hydrostatically test in accordance with AWWA C600-99.

C. Pressure Piping:

1. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.

2. Wait 5 days minimum after concrete thrust blocking is installed to perform pressure tests. If high-early strength cement is used for thrust blocking, wait may be reduced to 2 days.

3. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.

4. Chemical Piping: Test, dry, and clean in accordance with requirements of Chlorine Institute Pamphlet 6.

5. New Piping Connected to Existing Piping:

a. Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges, or as acceptable to Engineer.

b. Test joint between new piping and existing piping by methods that do not place entire existing system under test load, as approved by Engineer.

6. Items that do not require testing include: Piping between wetwells and wet well isolation valves, Equipment seal drains, tank overflows to atmospheric vented drains and tank atmospheric vents.

7. Test Pressure: As specified in specifications or as specified by equipment manufacturer.

D. Test section may be filled with water and allowed to stand under low pressure prior to testing.

E. Gravity Piping:

1. Perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.

2. Determine groundwater level at time of testing by exploratory holes or other method acceptable to Engineer.

3. Pipe 42 Inches Diameter and Larger: Joint testing device may be used to isolate and test individual joints.

3.02 HYDROSTATIC TEST FOR PRESSURE PIPING

A. Fluid: Clean water of such quality to prevent corrosion of materials in piping system.

B. Exposed Piping:

1. Perform testing on installed piping prior to application of insulation.

2. Maximum Filling Velocity: 0.25 foot per second, applied over full area of pipe.

3. Vent piping during filling. Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.

4. Maintain hydrostatic test pressure continuously for 30 minutes, minimum, and for such additional time as necessary to conduct examinations for leakage.

5. Examine joints and connections for leakage.

6. Correct visible leakage and retest as specified.

7. Empty pipe of water prior to final cleaning or disinfection.

3.03 HYDROSTATIC TEST FOR GRAVITY PIPING

A. Testing Equipment Accuracy: Plus or minus 1/2 -gallon water leakage under specified conditions.

B. Maximum Allowable Leakage: 0.16 gallons per hour per inch diameter per 100 feet. Include service connection footage in test section, subjected to minimum head specified.

C. Gravity Sanitary and Roof Drain Piping: Test with 15 feet of water to include highest horizontal vent in filled piping. Where vertical drain and vent systems exceed 15 feet in height, test systems in 15-foot vertical sections as piping is installed.

D. Exfiltration Test:

1. Hydrostatic Head:

a. At least 6 feet above maximum estimated groundwater level in section being tested.

b. No less than 6 feet above inside top of highest section of pipe in test section, including service connections.

2. Length of Pipe Tested: Limit length such that pressure on invert of lower end of section does not exceed 30 feet of water column.

E. Infiltration Test:

1. Groundwater Level: At least 6 feet above inside top of highest section of pipe in test section, including service connections.

F. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.

G. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.04 PNEUMATIC TEST FOR PRESSURE PIPING

A. Do not perform on:

1. PVC or CPVC pipe.
2. Piping larger than 18 inches.
3. Buried and other non-exposed piping.

B. Fluid: Oil-free, dry air.

C. Procedure:

1. Apply preliminary pneumatic test pressure of 25 psig maximum to piping system prior to final leak testing, to locate visible leaks. Apply soap bubble mixture to joints and connections; examine for leakage.
2. Correct visible leaks and repeat preliminary test until visible leaks are corrected.
3. Gradually increase pressure in system to half of specified test pressure. Thereafter, increase pressure in steps of approximately one-tenth of specified test pressure until required test pressure is reached.
4. Maintain pneumatic test pressure continuously for minimum of
5. 10 minutes and for such additional time as necessary to conduct soap bubble examination for leakage.
6. Correct visible leakage and retest as specified.

D. Allowable Leakage: Piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leakage.

E. After testing and final cleaning, purge with nitrogen those lines that will carry flammable gases to assure no explosive mixtures will be present in system during filling process.

3.05 PNEUMATIC TEST FOR GRAVITY PIPING

A. Equipment:

1. Calibrate gauges with standardized test gauge provided by Contractor at start of each testing day. Engineer will witness calibration.
2. Install gauges, air piping manifolds, and valves at ground surface.
3. Provide pressure release device, such as rupture disc or pressure relief valve, to relieve pressure at 6 psi or less.
4. Restrain plugs used to close sewer lines to prevent blowoff.

B. Procedure:

1. Require that no person enter manhole where pipe is under pressure.

2. Slowly introduce air into pipe section until internal air pressure reaches 4 psi greater than average back pressure of groundwater submerging pipe.

3. Allow 2 minutes minimum for air temperature to stabilize.

C. Allowable Leakage: Test section will be considered defective when time required for pressure to decrease from 3.5 to 2.5 psi greater than average back pressure of groundwater submerging pipe is less than that computed utilizing values from following table:

TABLE 1*

A Pipe Diameter (Inches)	B Time per Foot up to Length in Col C (Seconds)	C Test Length (Feet)	D Test Time for any Length Between Col C & E (Min:Sec)	E Length at Which Time in Col F Applies (Feet)	F Time per Foot for Total Length (Seconds)
4	0.18	636	1:54	1,114	0.10
6	0.40	424	2:50	743	0.23
8	0.71	318	3:47	557	0.41
10	1.11	255	4:43	446	0.63
12	1.60	212	5:40	371	0.91
15	2.50	170	7:05	297	1.42
18	3.62	141	8:30	248	2.06
21	4.92	121	9:55	212	2.81
24	6.42	106	11:20	187	3.67

EXAMPLE: 15-inch diameter pipe:
For 150 feet, T = 2.50 sec (Col B) x 150 ft = 375 sec = 6:15 For 250 feet, T = 7:05 (Col D)
For 500 feet, T = 1.42 sec (Col F) x 500 ft = 710 sec = 11:50

*Based on 0.003 cfm per square foot with a minimum significant loss of 2 cfm and a maximum loss of 3.5 cfm.

D. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.

E. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.06 FIELD QUALITY CONTROL

A. Test Report Documentation:

1. Test date.

2. Description and identification of piping tested.

3. Test fluid.

4. Test pressure.

5. Remarks, including:
    a. Leaks (type, location).
    b. Repair/replacement performed to remedy excessive leakage.
6. Signed by Contractor and Owner's Representative to represent that test has been satisfactorily completed.

END OF SECTION 40 42 80

SECTION 40 63 00
PROCESS CONTROL SYSTEM EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers process instruments and transmitters to be installed for system monitoring, including but not limited to: float switches; pressure gauges, pressure transmitters and related enclosures.

B. Items specified in this section shall include all materials, equipment, and work required for implementation of completely operable instruments. Instruments shall include primary elements for process variable measurements, analog and discrete outputs, and display and control elements (where specified).

C. The Contractor shall conduct all calibration adjustments, troubleshooting, and startup to assure instruments are properly operating and interfaced with other equipment. (See Special Provisions for system testing and startup requirements.)

D. Instruments specified in this section are subject to the requirements of Section 01 60 00 – Product Requirements.

1.02 SUBMITTALS

A. In addition to the requirements of Section 01 60 00, the following documentation shall also be provided for this equipment and accompany other required submittals:

1. Electrical drawings including circuit schematics, interconnection diagrams, and all information necessary for connection of electrical power and input/output circuits.

2. Panel elementary diagrams of pre-wired panels, including identification of all switched analog signals and all auxiliary devices such as relays, alarms, fuses, and lights.

3. Interconnecting wiring diagrams to tie instruments to Owner’s telemetry system where shown on the Drawings, including all component and panel terminal board identification numbers and external wire numbers. This diagram shall include all intermediate terminations between field elements and panels (e.g., terminal junction boxes, motor control centers, etc.).

4. Hydraulic characteristics and requirements for all flow-, pressure-, or level-related devices.

5. Any special options included for each instrument.

6. Submittal information for each instrument shall bear the component name and instrument tag number designation shown in the P&ID Drawings, where applicable.

7. Manufacturer’s ratings for each instrument, including:

a. Certified accuracy and precision (including repeatability).

b. Scale range.

c. Environmental tolerance (temperature, humidity, electrical induction isolation, and chemical resistance).

d. UL, ANSI, or other ratings.

8. Dimensional drawings and ratings for all instrument panels and enclosures.

9. Specifications, ratings, and power requirements for any heating or ventilating devices installed in instrument enclosures.

B. Spare Parts:

1. The Contractor shall provide a list of the manufacturer's recommended spare parts and quantities to sustain equipment provided under this section. Unit and total costs for the recommended parts inventory shall be included.

C. Operating and Maintenance Manuals: Manufacturer's O & M manuals shall be provided for each electrified instrument per Section 01 60 00 – Product Requirements.

D. Record Drawings: The Contractor shall provide one set of record drawings in both hard copy and electronic format for any field-wired interconnects between instruments or controllers.

1.03 RESPONSIBILITY FOR COMPLETE SYSTEM

A. Unit Responsibility for Process Instruments:

1. Unit responsibility for the Process Instruments shall be provided by the Contractor.

B. The Contractor shall be responsible for coordination of the work to ensure that:

1. All components provided under this section are properly installed.

2. The proper type, size, and number of control wires with their conduits are provided and installed.

3. Proper electric power and control circuits are provided for all components and systems.

4. Instrumentation cable, power conductors, and conduits, and the installation thereof shall be provided and installed to meet the requirements of Division 26 – Electrical.

PART 2 - MATERIALS

2.01 GENERAL

A. Like items of equipment provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

2.02 EQUIPMENT SPECIFICATIONS

A. Unless superseded by other specifications herein or the manufacturer's standard ratings for a referenced instrument brand and model, all instruments shall be capable of the following minimum accuracy and precision:

1. Accuracy: plus-or-minus 1.0% of full scale
2. Precision: plus-or-minus 0.5% of full scale

B. Environmental Conditions: Unless otherwise noted, equipment shall be suitable for the following environmental conditions:

1.	Temperature	32 ˚to 120˚ F
2.	Relative Humidity	10 to 90 percent
3.	Enclosure Rating	NEMA Type 1/2 (panel-mounted instruments); NEMA 4X (outdoor electrical panels) NEMA 7 (Class I, Div. 1)
4.	Classification	Non-Hazardous
5.	Process Water Temperature	32˚ to 100˚ F

C. Wiring:

1. All electrical wiring shall be in accordance with the applicable requirements of Section 16 - Electrical. Instrumentation cable and power conductors shall meet the requirements stated therein.
2. Wiring for signal circuits and 24VDC shall not be smaller than No. 18 AWG, and be separated at least 18 inches from any 120 VAC power wiring.
3. All interconnecting wires between panel mounted equipment and external equipment shall be terminated at numbered terminal blocks. <u>All wires shall be color coded, and be identified by permanent plastic number tags placed within 2 inches of each termination</u>.
4. <u>Wiring run in panels shall be run in covered wiring duct identified by permanent plastic number tags within two inches of entering and leaving the duct</u>. Wiring duct shall be covered, constructed of plastic and be of a snap-in slot type design.

D. Terminal Blocks:

1. Terminal blocks shall be one-piece molded plastic blocks with screw type terminals and barriers rated for 300 volts. Terminals shall be double sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall be numbered and have permanent, legible identification, clearly visible with the protective cover removed.
2. Wires shall be terminated at the terminal blocks of one of the following ways:
   a. Crimp type, pre-insulated, forked-tongue lugs for screw post terminals.
   b. Bared wire ends for clamp-type terminals.
3. Lugs shall be of the appropriate size for the terminal block screws and for the number and size of the wires terminated.

2.03 INSTRUMENT SPECIFICATIONS

A. Float Switches and Level Alarm Panels

1. Where shown on the Drawings, high and/or low level alarm panels with float switches and accessories shall be installed in the lift station wetwells and buried tanks. Level alarm panels shall be self-contained units, including float switches by the panel manufacturer.

2. Level alarm panels shall be NEMA 4X non-metallic enclosures with 85 db alarm buzzer and red alarm beacon. Units shall be UL listed. Separate test and silence buttons shall be provided, and alarms shall reset automatically. Panels shall have a 5A, 120V auxiliary alarm contact. Units shall operate on 120 VAC, and shall have a two-year limited warranty.

3. Float switches for alarm panels shall be hermetically sealed, stainless steel mercury switch floats with water and oil resistant cables and narrow angle NO or NC contacts, as required for the application.

4. Floats shall be furnished with zinc-plated cast iron cord weights by the float manufacturer.

5. Low Level alarm panels shall include (6) auxiliary contacts to be wired through 24VDC “pump enable” circuits from/to pump VFDs to prevent pumping if a low level condition exists (pumps).

6. High Level alarm panels shall include a single pair of auxiliary contacts to be wired to the alarm dialer.

7. Both high and low level alarm panels shall include a red beacon mounted atop the panels and an alarm horn with “silencing” feature.

8. Level alarm and float switch systems shall be Conery Manufacturing model 10A500-(6)C3 for low level alarm/pump enable panels and model Observer 400 for high level alarm panels, all with ‘C10’ cord weights, ’1FB’ float brackets, and ‘G1’ cord grips, or equal.

B. Pressure Gauges

1. Pressure Gages:

a. Shall be Bourdon tube actuated pressure gauges. Gauges shall be metal cased and silicone (DC200) liquid filled. Gauges shall be stem mounted with minimum 2 1/2-inch dial size, unless otherwise noted. Gauge shall be ANSI Grade 2A: accuracy of plus or minus 1/2 percent of span.

b. The sensing element shall be phosphor-bronze, unless otherwise noted.

c. Pressure gauges for all but clean water or NPW applications shall be furnished with diaphragm seals, and pressure gauges with integral diaphragm seals are acceptable. Diaphragm seals are to be compatible with municipal wastewater or specific chemicals according to their installed location. Diaphragm seals shall be

Ashcroft capsule type, or approved equal.

d. All pressure gauge assemblies shall include an isolation valve between the pressure gauge (or diaphragm seal) and the carrier pipe. Isolation valves for wastewater shall be bronze body ball valves with standard or full port Teflon seats, and shall be rated for min. 600 psi water pressure. Isolation valves for chemical service shall be PVDF body ball valves rated for 230 psi pressure.

e. Units shall be Ashcroft ‘Duragauge’, Robert Shaw ‘Acragauge’, Marshall, or equal.

C. Lift Station Level Sensing Transducer:

1. The level sensing transducer for the lift station pumps shall be as described in Section 43 25 00 –LIFT STATION PUMPS & CONTROLS

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate process instrument electrical interface, installation and startup of all process instruments.

B. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturers' instructions, and these Contract Documents, follow Engineer's decision, at no additional cost to Owner. Keep copy of manufacturers' instructions on the jobsite available for review at all times.

3.02 ELECTRICAL POWER AND SIGNAL WIRING

A. Control and signal wiring external to the control panels and all power wiring shall conform to the requirements of Division 26 - Electrical.

B. Control and signal wiring in control panels shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end so that any bending or twisting will be around the axis of the wire, and the bend area shall be protected with a sleeve.

C. Arrange wiring neatly, cut to proper length, and remove surplus wire. Provide abrasion protection for wire bundles passing through holes or across metal edges.

D. Wiring shall not be spliced or tapped except at device terminals or terminal blocks.

3.03 SPECIAL REQUIREMENTS FOR FLOAT SWITCHES

A. Manufacturer’s cables for float switches shall be supported and routed as shown on the Drawings, with slack cable provided in handholes or hatchways to facilitate float switch removal and replacement.

B. Cables shall be completely stress relieved. Support points and tie-off’s shall be fully cushioned to prevent cable damage, and in full accordance with manufacturer’s installation recommendations.

C. Cabling from probes shall be protected with neoprene grommets where entering conduit ends, sleeves, panels, or any sharp-edged openings in order to protect the cable.

D. Floats shall be visible from the hatch/access in the floor or tank openings to allow for easy removal, replacement, testing, etc.

3.04 CONTRACTOR TESTING

A. Calibrate, condition, and test all instruments in accordance with manufacturers' recommendations prior to demonstrating instruments and placing in service.

B. Provide testing and functional demonstration of all monitoring and control functions as described in manufacturers' submittals and the construction drawings.

C. See Special Provisions for system demonstration and testing requirements.

END OF SECTION 40 63 00

SECTION 40 71 13
MAGNETIC FLOW METER AND TRANSMITTER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Special Provisions of the Contract, including general and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This specification includes the installation of an electromagnetic flow meter and transmitter suitable for fixed-site measurement of bi-directional flow in a full pipe. The flow meter shall consist of a flow tube, internal data logger and a flow transmitter, which shall indicate, totalize and transmit flow. The flow tube shall use a spool piece configuration with field-interchangeable sensors containing coils and electrodes. The flow velocity measured in the flow meter is converted through a microprocessor into a flow measurement recorded in conventional English units. Both instantaneous and cumulative flow will be recorded. The system will not lose memory and recorded flows if the power is interrupted. The transmitters will send a 4 to 20 mA signal or digital signal to the composite samplers, pump control panels, and package plant controls. The following schedule shows the size of the meters, location and cable length.

Schedule for Plant Flow Meters

Location	Size	Cable Length (ft)
Forcemain (Effluent)	3”	25 ft
Package Plant Influent	TBD	TBD
Package Plant RAS	TBD	TBD
Package Plant MBR	TBD	TBD
Package Plant Recirculation	TBD	TBD
Package Plant Recycle	TBD	TBD

1.03 SUBMITTALS

A. Submit Product Materials lists of items proposed to be provided under this section.

B. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this section with the work of adjacent trades.

D. Manufacturer's recommended installation procedures which, when approved, will become the basis for accepting or rejecting actual installation procedures used on the work.

E. Operations manuals for each part or piece of equipment, suitable to instruct the operator in the use, calibration and programming of the flow measuring equipment. Four hard

copies and one electronic copy of the manual will be required.

PART 2 - PRODUCTS

2.01 METER

A. Shall be a velocity sensing electromagnetic type flanged tube meter with sealed housing for 150 PSI working pressure. The meter sizes shall be as described in the schedule in the previous section 1.0 above, based on use of Ultra Mag. The meters shall be equipped with a 9 digit digital totalizer reading in units of gpm and shall be accurate within 0.5% of actual flow. The meter assembly shall operate within a range of 0.2 FPS to 32 FPS and be constructed as follows: Meter Tube (Sensor) shall be fabricated stainless steel pipe and use 150 lb. AWWA Class "D" flat face steel flanges or be a wafer style. The internal and external of the meter tube shall be blasted and lined with a NSF approved fusion bonded epoxy UltraLiner™, applied by the fluidized bed method. Meter tubes shall have a constant nominal inside diameter offering no obstruction to the flow. Electrodes shall be 316 stainless steel.

B. Other meter manufacturers will be considered if general compliance with these specifications can be documented and no specific changes in plant piping are required to address a different type of meter or meter with different hydraulic installation requirements.

C. Certifications

1. CE Certified (Converter only)
2. Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 and CSA C22.2 No.61010-1-04
3. ISO 9001:2015 certified quality management system

2.02 MAG SHIELD

A. Shall be welded to the tube providing a completely sealed environment for all coils, electrode connections and wiring harness capable of NEMA 6P/IP68 operation.

2.03 SIGNAL CONVERTER

A. Shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs, and 2 digital volumetric pulse output. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault

conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The flow transmitter shall operate on 120 VAC, 50/60 Hz line power. Typical power consumption shall be 10 W, including the sensors.

B. The converter shall be integrally mounted or remotely mounted up to 500 feet from the sensor, and shall be supplied in a rugged, watertight, dust-tight, corrosion resistant (NEMA 4X and IP67) cast aluminum, epoxy painted enclosure suitable for conduit connections. The enclosure shall include a polycarbonate window for viewing the LCD without opening the enclosure. Calibration will be completed at the manufacturer's location in accordance with customer supplied application-based requirements.

C. The converter shall have an internal data logger.

2.04 GROUNDING RINGS

A. Shall be 316 stainless steel and shall be supplied with the meter tube. For best performance grounding rings must be used.

2.05 POWER AND SIGNAL ISOLATION

A. The power supplied between the converter and the meter tube (sensor) and signal between the meter tube and the converter shall be isolated and placed in separate submersible cables.

2.06 SERVICE & SUPPORT

A. Supplier must have flow calibration laboratories and personnel to perform testing and certify calibration. Personnel must also provide instruction or training as required assuring meters are supported and maintained throughout the guarantee period. Classroom Training on the equipment shall follow the requirements in Division 1.

2.07 VOLUMETRIC TESTING

A. Testing of all meters must be performed and approved prior to shipment. The complete meter assembly and signal converter must be wet accuracy tested and calibrated. The test facility must be rigorously traceable to an accuracy of ±0.15% with the National Institute of Standards and Technology. If desired, the test shall be witnessed by the customer or their selected agent. A copy of the certified accuracy test record must be furnished at no charge to the customer.

2.08 ONE MANUFACTURER

A. Shall make all meter sizes and styles required for this contract. The meters shall be manufactured and tested in the United States.

PART 3 - EXECUTION

3.01 INSTALLATION/WORKMANSHIP

A. The meter tube, sensor and transmitter will be installed in accordance with the manufacturer's specifications.

B. Installation will be made similar to placing a short length of flanged end pipe in the line. The meter can be installed vertically, horizontally, or inclined on suction or discharge lines. The meter must have a full pipe of liquid for proper operation. Fluid must be grounded to the downstream flange of the sensor.

C. Any 90 or 45 degree elbows, valves, partially opened valves, etc. should not be placed closer than one pipe diameters upstream and zero pipe diameters downstream for flow meters 4 inches and larger and three pipe diameters upstream and 1 pipe diameter downstream for flow meters 2-3 inches. All blending and chemical injection should be done early enough so the flow media is thoroughly mixed prior to entering the measurement area.

D. Meter shall be provided with a four written and one electronic copy of operating instructions.

3.02 PAINTING

A. Provide manufacturer's standard coating.

B. Finish coat under provisions of Section 09 90 02 – High Performance Painting and Coating.

END OF SECTION 40 71 13

DIVISION 43

PROCESS GAS & LIQUID HANDLING, STORAGE EQUIPMENT

SECTION 43 25 00
LIFT STATION PUMPS & CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work under this section includes, but is not limited to, furnishing and installing a factory built duplex pump station in the raw wetwell and in the treated wetwell as indicated on the project drawings and herein specified, as necessary for proper and complete performance.

B. The principal items of equipment to be provided:

1. Raw Wetwell – Shall include two submersible (dry pit) solids handling pumps, each with compatible dry suction elbow stands, and anchor bolts.

2. Treated Wetwell – Shall include two submersible centrifugal solids handling pumps, each with compatible quick discharge connector system, guide rails, anchor bolts, stainless steel lifting cables or chain with associated hardware, steel powder coated station valves, and internal piping.

3. Control Panel – Complete factory built/assembled motor control center with circuit breakers, motor starters and automatic liquid level control system as specified herein to constitute a complete, working system. There shall be one control panel housing all equipment for both the raw and treated pumps, or approved equal. The panel shall fit in the existing wall space in conjunction with the main electrical panels as shown on the Contract drawings.

C. The raw pumps, pump accessories, pump control panel, valves, piping, and fittings shall be installed within the lift station building as shown on the project plans.

D. the treated pumps and mechanical slide rail accessories shall be installed in the existing concrete wet well as shown on the project plans. The pump control panel, valves, piping, and fittings shall be installed within the lift station building as shown on the project plans.

E. Factory built pump station design, including materials of construction, pump features, and motor controls shall be in accordance with requirements listed under Part 2 – Products of this section.

1.02 REFERENCES

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

B. American National Standards Institute (ANSI) and American Water Works Association (AWWA)

1. ANSI B16.1, Cast iron pipe flanges and flanged fittings

2. ANSI/AWWA C115/A21.51, Cast/ductile iron pipe with threaded flanges

3. ANSI 253.1, Safety Color Code for Marking Physical Hazards

4. ANSI B40.1, Gauges, Pressure and Vacuum
5. AWWA C508, Single Swing Check Valves
6. AWWA C504, Plug Valves

C. American Society for Testing and Materials (ASTM)
1. ASTM A48, Gray Iron Castings
2. ASTM A126, Valves, Flanges, and Pipe Fittings
3. ASTM A307, Carbon Steel Bolts and Studs
4. ASTM F593, Stainless Steel Bolts, Hex Cap Screws, and Studs
5. ASTM A36, Structural Steel

D. Institute of Electrical and Electronics Engineers (IEEE)
1. ANSI/IEEE Std. 100, Standard Dictionary of Electrical Terms
2. ANSI/IEEE Std. 112, Test Procedure for Polyphase Induction Motors
3. IEEE Std. 242, Protection of Industrial and Control Power Systems

E. National Electric Code (NEC), National Electrical Manufacturers Association (NEMA)
1. NEC 701, National Electric Code article 701
2. NEMA Std. MG1, Motors and Generators

F. Miscellaneous References
1. Ten-State Standards Recommended Standards for Sewage Works
2. Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps
3. NMTBA and JIC Std. National Machine Tool Builders Association and Joint Industrial Council Standards

1.03 PERFORMANCE CRITERIA

A. Each raw pump must be designed to handle raw, unscreened, wastewater. Pumps shall be furnished with a 4" discharge connection and be capable of delivering the flows indicated for the raw pumps in Part 2 – Products.

B. Each treated pump must be designed to handle treated wastewater. Pumps shall be furnished with a 3" discharge connection and be capable of delivering the flows indicated for the treated pumps in Part 2 – Products.

C. Site power furnished to list station building shall be 208V, 3-Phase, 60 Hertz, maintained within industry standards.

1.04 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 30 00. In addition, the following specific information shall be provided:

B. Product Data:

1. Prior to fabrication, the pump station manufacturer shall submit copies of submittal data for review and approval. Additional copies will be provided as required to comply with the contractor, supplier, or manufacturer's need for extra returned copies.
2. Submittal shall include shop drawings, electrical schematic diagrams, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor data, pump characteristic curves to illustrate the design duty point capacity (GPM), head (FT), pump efficiency (np) and brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.
3. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for the Quick Discharge Connector, base elbow, and guide rail components. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. Electrical schematic diagrams shall illustrate motor branch and liquid level control circuits to the extent necessary to validate function and integration of circuits to form a complete working system.

C. Operation and Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly install, operate, and maintain all equipment supplied. Content and instructions shall assume operations personnel are familiar with pumps, motors, piping and valves, but lack experience on the exact equipment supplied.
2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. A separate section in the O&M Manual shall be designated for support data on any equipment supplied by others, even if mounted or included in overall station design; support data shall be provided by those supplying the equipment and inserted into the O&M Manual in this section. Instructions shall include the following as a minimum:
    a. Functional description of each major component, complete with operating instructions.
    b. Instructions for operating pumps and pump controls in all modes of operation.
    c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.
    d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
    e. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA70. Schematics shall illustrate, to the extent of authorized repair,

pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, valves and piping.

3. Operation and maintenance instructions that rely on vendor cut-sheets and literature that includes general configurations, or requires operations personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

1.05 QUALITY ASSURANCE

A. Upon request from the engineer (or owner), the pump station manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

B. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. “Reverse- engineered” products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

C. The term “pump manufacturer” or “pump station manufacturer” shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a “pump manufacturer” or “pump station manufacturer” and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

D. All raw pump openings and passages shall be of adequate size to pass 3" diameter spheres and any trash or stringy material which can pass through an average house collection system.

E. All treated pump openings and passages shall be of adequate size to pass 2.5" diameter spheres.

F. The manufacturer’s technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.06 MANUFACTURER'S WARRANTY

A. The pump station manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

   1. All other equipment, apparatus, and parts furnished shall be warranted for one (1) year, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.

B. Components that fail to perform as specified by the Engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

D. Equipment supplied by others and incorporated into a pump station or enclosure is not covered by this limited warranty. Any warranty applicable to equipment selected or supplied by others will be limited solely to the warranty, if any, provided by the manufacturer of the equipment.

E. This limited warranty shall be valid only when installation, use, and maintenance is performed in accordance with manufacturer recommendations. A start-up report competed by an authorized manufacturer's representative must be received by manufacturer within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of substantial completion.

PART 2 - PRODUCTS

2.01 UNITARY RESPONSIBILITY

A. In order to unify responsibility for proper operation of the complete pump station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source) for the raw pumps and the treated pumps. The control panel shall incorporate both sets of pumps into one panel. The pumping station(s) must be of standard catalog design, totally warranted by the manufacturer.

2.02 MANUFACTURER

A. The specifications and project drawings generally depict equipment and materials manufactured by Crane/Deming (raw pumps), Hydromatic/Pentair (treated pumps) and Cogent (control panel). It is not intended, however, to eliminate other products of equal quality and performance.

B. In event the Contractor obtains Engineer's approval for equipment substitution, the Contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed

equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the engineer prior to bid.

2.03 RAW SUBMERSIBLE SEWERAGE PUMPS (dry pit)

A. Requirements

1. Furnish and install 2 submersible non-clog wastewater pump(s) capable of being installed in a dry pit. Each pump shall be equipped with a suitably-sized, electric motor connected for operation on 208 volts, 3-phase, 60 hertz service. The power cable shall be sized according to NEC and ICEA standards and have P-MSHA Approval. Preliminary pump sizing indicates a 5 HP motor will be suitable to achieve the operating point outlined in 2.04.B.1 below:

B. Pump Design Configuration (Dry pit installation)

1. The pump shall be supplied with a mating cast iron or steel vertical dry suction elbow stand 4 inch discharge connection and be capable of delivering 100 gpm at 13.2 ft. TDH. To further define the desired pump performance curve, two more points on the pump curve shall be: 120 gpm at 16' and 80 gpm at 20.3'. Shut off head shall be 29 ft. (minimum). The pumps shall be designed to pass solids up to 3” in diameter. The pumps shall be capable of running in a dry-pit installation without causing damage to the pumps including the motor and all ancillary components.

C. Pump Motor

1. Motor(s) shall be sized to operate without exceeding the nameplates rating. The motor shall meet NEMA Design B standards with three phase torque curve. Air-filled, squirrel cage induction inverter duty rated per NEMA MG1.

a. Insulation: Class H varnish and magnet wire

b. Efficiency: IE3

c. Frequency: 60 Hz

d. Service Factor: 1.15

2. Motor shall have thermal overload protection. The inner seal chamber shall have a moisture sensing probe with leads for connection to a relay with test button. Motors shall be dielectric oil filled for optimal thermal management and maximum bearing life.

D. Pump Construction

1. Pump case, motor case, seal plate and adapter shall be ASTM A-48 Class 35B cast iron. Discharge flange shall be sized in accordance with standard flange designations and slotted to accommodate ANSI flanges. Impeller shall be ASTM A-536 ductile iron (ASTM A-532 class III Type A White Iron for abrasive applications) with a keyed, tapered shaft bore. The impeller shall be enclosed, solids handling type designed to pump industrial wastes and wastewater and be dynamically balanced to ISO G6.3 specifications.

2. Shaft shall be constructed of 416 stainless steel and feature a tapered impeller end to automatically center and self-seat the impeller for vibration free operation. All exposed hardware including the oversized lifting bail shall be 300 series stainless steel.

3. The pump(s) shall be equipped with a CSA-qualified submersible quick connect power cable constructed in accordance with type W guidelines and shall include the moisture and temperature sensor leads. Cord connection shall be a pump mounted plug and a rigid cord socket contained by a cast iron housing bolted to the motor with epoxy-potted cable connections and sealed by compressed O-rings.

E. Cooling System

1. Pump(s)/Motor(s) shall be capable of operating in a dry pit configuration without overheating and causing damage to the pump/motor. The system shall be a closed loop.

F. Cable Entry Seal

1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. ***The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.***

G. Motor

1. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the

terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.

2. Protection shall be bi-metallic, temperature sensitive disc, sized to open at 120°C and automatically reset at 30-35 °C differential.

3. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

4. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

H. Shielded Power Cable

1. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The power cable shall be of a shielded design in which an overall tinned copper shield is included and each individual phase conductor is shielded with an aluminum coated foil wrap. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber.

I. Bearings

1. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single row ball bearing with radial load. The lower bearing shall be a double row angular contact bearing to compensate for axial thrust and radial forces. ***Single row lower bearings are not acceptable***. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

J. Mechanical Seal

1. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.

2. Inboard: Carbon rotating face, silicon carbide stationary face

3. Outboard: Silicon carbide rotating face, silicon carbide stationary face
4. Elastomer: Buna-N
5. Hardware: 300 series stainless steel
6. Seal lubricant shall be non-hazardous.

K. Pump Shaft

1. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be 416 stainless steel – ASTM A479 S43100-T.
2. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

L. Impeller (Adaptive)

1. The impeller shall be of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on a replaceable insert ring.
2. The impeller shall have vanes hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position.

M. Volute / Suction Cover

1. The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall have a guide pin integral to the casting and shall be cast of ASTM A-48, Class 35B grey iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

N. Protection

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the

motor and activate an alarm

2. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.

2.04 TREATED SUBMERSIBLE SEWERAGE PUMPS (wet-well)

A. Requirements

1. Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a suitably-sized, submersible electric motor connected for operation on 208 volts, 3-phase, 60 hertz service, with a minimum 15 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and have P-MSHA Approval. Preliminary pump sizing indicates a 2 HP motor will be suitable to achieve the operating point outlined in 2.04.B.1 below:

B. Pump Design Configuration (Wet pit installation)

1. The pump shall be supplied with a mating cast iron 3 inch discharge connection and be capable of delivering 60 gpm at 19.7 ft. TDH. To further define the desired pump performance curve, two more points on the pump curve shall be: 50 gpm at 21' and 100 gpm at 17'. Shut off head shall be 10 ft. (minimum). The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with a minimum 15 ft of stainless steel lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

C. Pump Construction

1. Major pump components shall be of grey cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. The lifting handles shall be of stainless steel. All exposed nuts or bolts shall be AISI type 316 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

2. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or optional Viton rubber O-rings. Fittings will be the result of

controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

3. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

D. Cooling System

1. Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required. The motor shall be enclosed, oil cooled induction, suitable with a VFD.

E. Cable Entry Seal

1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. ***The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.***

F. Motor

1. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same

manufacturer.

2. Protection shall be bi-metallic, temperature sensitive disc, sized to open at 120°C and automatically reset at 30-35 °C differential.

3. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

4. The motor shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

5. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

G. Shielded Power Cable

1. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The power cable shall be of a shielded design in which an overall tinned copper shield is included and each individual phase conductor is shielded with an aluminum coated foil wrap. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

H. Bearings

1. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. ***Single row lower bearings are not acceptable***. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

I. Mechanical Seal

1. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion and

abrasion resistant ***tungsten-carbide*** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide seal ring.

2. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

3. The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

4. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

5. Where a seal cavity is present in the seal chamber, the area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

6. Seal lubricant shall be non-hazardous.

J. Pump Shaft

1. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel – ASTM A479 S43100-T.

2. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

K. Impeller (Adaptive)

1. The impeller shall be of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each

rotation as they pass across a spiral groove located on a replaceable insert ring.

2. The impeller shall have vanes hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position.

L. Volute / Suction Cover

1. The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall have a guide pin integral to the casting and shall be cast of ASTM A-48, Class 35B grey iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

M. Protection

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm

2. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.

2.05 ELECTRICAL CONTROL COMPONENTS

A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide motor control panel as specified herein.

B. There shall be one control panel housing ALL equipment for both the raw and treated pumps, or approved equal. **The panel shall fit in the existing wall space in conjunction with the main electrical panels as shown on the Contract drawings. The submittal for the control panel shall include a drawing of the control panel on the existing wall showing that the panel will fit in the existing space. The drawing shall show all dimensions of the wall space, control panel, and reference any other equipment mounted adjacent to the panel with dimensions. Preliminary sizing of the control panel cabinet was 60"x47"x9" (HxWxD).**

C. The motor control panel shall be assembled and tested by a shop meeting U.L. Standard

508A and 698A Standard for industrial controls. The motor and control panel shall be assembled and tested by the same manufacturer/representative supplying the raw and treated pumps so as to insure suitability and assurance of experience in matching controls to motors and to insure single source responsibility for the equipment.

D. The control panel shall comply with the NEC regulations. The panel shall contain all components required by the pump manufacture for starting and protection of the motor. Any features required by the pump manufacture for warranty of the pump shall be included in the control panel.

E. Raw & Treated Pumps: The level control system shall start one pump when the liquid level in the wet well rises to the “lead pump start level”. When the liquid is lowered to the “pump stop level”, the system shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level rise to the “lag pump start level”, the system shall start the second pump so that both pumps are operating to pump down the well. Both pumps shall stop at the same “stop” level.

F. The control panel shall alternate pumps (lead pump) between starts. Alternation shall occur at the end of each pumping cycle.

2.06 CONSTRUCTION

A. The controls for the pump shall be contained in a stainless steel enclosure meeting NEMA 4X requirements with a hinged door and neoprene gasket. The sub-panel shall be stainless steel.

B. The enclosure shall have provisions for padlocking. A nameplate shall be permanently affixed to the panel and include the model number, voltage, phase, hertz, ampere rating and horsepower rating. A warning label against electric shock shall be permanently affixed to the outer door.

C. Hand-Off-Auto switches shall be provided for each pump. All switches and push buttons shall be mounted on a corrosion-resistant operator safe dead-front with a corrosion resistant full length hinge.

D. Pilot lights shall be furnished for each pump for run status and seal failure. All pilot lights shall be mounted on the corrosion-resistant operator safe dead-front.

E. All pilot lights and switches shall be properly labeled as to function. The labels shall be ¾" by 3" two layer laminated plastic, white on black background. The labels shall be custom engraved by the control panel manufacturer and fastened to the dead-front. Labeling shall be provided to clearly indicate whether the controls are for the raw or treated pumps

F. Pump control panel shall incorporate seal failure relays into control operation. Should water penetrate the lower seal of the pump, an adjustable seal failure relay shall be energized via the pump manufacturer’s seal fail probe, alerting the operator of impending pump failure. The relay shall energize a pilot light on the operator dead-front. The relay shall be 120VAC and have an adjustment of 4.7 to 100k ohms.

G. The incoming power shall be 208 volts, 3 phase, 60 hertz service. Terminal blocks with

box type lugs shall be supplied to terminate all wiring for floats and heat and seal sensors for the pump, if required. The pump leads shall be terminated at the overload relay or at box type terminal blocks. The terminal blocks for the float connections shall be on the pump controller.

H. A circuit breaker shall be used to protect from line faults. The panel shall have a main power disconnect interconnected with a handle on the dead-front for safety, and to disconnect the pump from the incoming power. Circuit breaker shall be thermal magnetic and sized to meet NEC requirements for motor controls.

I. Control voltage shall be 120 VAC and may be accomplished by the means of a transformer or available line voltage. A control fuse shall protect and isolate the control voltage from the line. Control transformer shall have primary and secondary circuit protection.

J. Wire ties shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. All wiring shall be color coded to facilitate maintenance and repair of the control panel. Where a color is repeated, number coding shall be added. A schematic shall be permanently attached to the inside surface of the front door.

K. All ground connections shall be made with ring tongue terminals and star washers to assure proper ground.

L. A duplex pump controller shall be provided for control logic. Pump controller shall be PLC logic utilizing conventional wiring. The pump control panel shall be completely self-contained and will require no additional hardware, software, or accessories for full operation. The pump controller shall be UL listed for Class I, Division 2.

M. The high level alarm shall be the only external light on the pump control panel.

2.07 VARIABLE SPEED DRIVE

A. A variable speed drive will be provided sized of the appropriate horsepower per equal size of each main pump. Furnish complete VFD as specified herein or in the equipment schedule for loads designated to be variable speed. VFD’s shall be user-selectable for either constant or variable torque loads.

B. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave.

C. The manufacturer of the VFD shall demonstrate a continuous period of manufacturing and development of VFD’s for a minimum of 40 years. VFD’s that are brand-labeled are not acceptable. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or de-rating.

D. VFD shall automatically boost power factor at lower speeds. In variable torque applications, the VFD shall provide a CT-start feature and be able to provide full torque at any speed up to the base speed of the motor. In either CT or VT mode, the VFD shall

be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.

E. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.

F. The VFD shall include an integral RFI filter conforming to the A2 standard as a minimum. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes. All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.

G. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC Link reactor shall be installed so that power fluctuations to the DC Capacitors shall be reduced to increase Capacitor life. VFD's without a DC link reactor shall provide a 5% impedance line side reactor and provide spare capacitors.

H. VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.5 msec. Printed Circuit boards shall be conformal coated to reduce the corrosion effect from environmental gases and other conditions. The conformal coating must meet IEC 61721-3-3, Class 3C2. VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.

I. VFD shall include current sensors to monitor all three-output phases to detect and report phase loss or unbalance or other power issues to the motor. The VFD will identify which of the output phases is low or lost.

J. VFD shall provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using a standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. The remote mount must meet N4 rating. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD

K. All VFD's shall be of the same series and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.

L. A battery back-up shall be provided to maintain internal clock operation during power interruptions. Battery life shall be no less than 10 years of normal operation.

M. The VFD shall have an adjustable output switching frequency.

N. Four complete programming parameter setups shall be provided, which can be locally selected through the keypad or remotely selected via digital input(s), allowing the VFD to be programmed for up to four alternate control scenarios without requiring parameter

changes.

O. In each programming set up, independent acceleration and deceleration ramps shall be provided. Acceleration and deceleration time shall be adjustable over the range from 0 to 3,600 seconds to base speed.

P. The VFD shall have four programmable “Bypass frequencies” with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency. The feature shall offer a Semi-Automatic program to simplify the set-up. In each programming setup, independent current limit settings, programmable between 50% and 110% of the drives output current rating, shall be provided.

Q. The VFD will include a “loss of follower” function to detect the loss of process feedback or reference signals with a live-zero value and a user-selectable choice of responses (go to set speed, min speed, max speed, stop, stop, and trip). An initial ramp function shall be available to provide a user-selectable ramp, up to 60 seconds, for applications requiring a faster or slower ramp than the normal ramp. A Dual Ramp feature shall include a Check Valve Ramp and a final Ramp feature. The Check Valve Ramp shall be programmable to gently seat a check valve and reduce the potential of damage from excess pressure while shutting-down the system. Both time and end speed shall be programmable. On the Final Ramp, the VFD shall be programmable to quickly stop the motor after seating of a check valve or for a more rapid stopping than the normal ramp down setting.

R. The ambient operating temperature of the VFD shall be -10ºC to 50ºC (14 to 1227F), with a 24- hour average not to exceed 45ºC. Elevation to 3,300 feet (1000 meters) without de-rating. VFD shall provide full torque to the motor, given input voltage fluctuations of up to +10% to -15% of the rated input voltage (525 to 690VAC, 380 to 480VAC, or 200 to 240VAC). Line frequency variation of ± 2% shall be acceptable.

S. The VFD shall be equipped with a standard RS-485 serial communications port and front-of-drive accessible USB port. Danfoss FC or ModBus RTU communications shall be integrally mounted. VFD Keypad shall be mounted and accessible from the exterior of the control panel door in a NEMA 4 configuration. Keypads mounted internally shall not be allowed.

2.08 PANEL

A. The Panel shall be equipped with the following additional features;

1. High level alarm light (Flashing)
2. High level alarm horn
3. Test-Off-Auto switch for alarm
    a. Lift Station Building – Alarm/Horn/Test off auto switch to be integrated into lift station panel and integrated into the package plant control system.
    b. The pumps shall be able to be controlled in the lift station, in the package plant, and remotely via the package plant control system. The liquid level shall information shall be available in the lift station, in the package plant, and

remotely via the package plant control system.

4. Elapsed time meter (per pump)
5. Seal failure light
6. Lightning arrestor
7. 110 volt convenience outlet

2.09 WIRING

A. The control panel, as furnished by the manufacturer, shall be completely wired. The Contractor shall field connect the power feeder lines to the main terminal block, final connections to the remote alarm devices, and the connections between the pump and the pump motor control. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC).

B. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:

1.	Line and load circuits, AC or DC power	Black
2.	AC control circuit less than line voltage	Red
3.	DC control circuit	Blue
4.	Interlock control circuit, from external source.	Yellow
5.	Equipment grounding conductor	Green
6.	Current carrying ground.	White
7.	Hot with circuit breaker open.	Orange

C. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 16-gauge minimum, type MTW or THW, 600 volts. Power wiring shall be 14-gauge minimum.

D. Motor branch and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered at each end in accordance with the electrical diagrams. All wires on the sub-plate shall be bundled and tied.

E. Wires connected to components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be provided to allow the door to swing to its full open position without undue stress or abrasion on the wire or insulation. Bundles shall be held in place on each side of the hinge by mechanical fastening devices.

2.10 CONDUIT

A. All conduit and fittings shall be UL listed. Liquid tight flexible metal conduit shall be

constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code. Conduit shall be sized according to the National Electric Code.

2.11 GROUNDING

A. The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections. The Contractor shall make the field connections to the main ground lug and each pump motor in accordance with the National Electric Code.

2.12 IDENTIFICATION

A. A permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:

1. Equipment serial number
2. Control panel short circuit rating
3. Supply voltage, phase and frequency
4. Current rating of the minimum main conductor
5. Electrical wiring diagram number
6. Motor horsepower and full load current
7. Motor overload heater element
8. Motor circuit breaker trip current rating
9. Name and location of equipment manufacturer

B. Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification label shall be mounted adjacent to the device.

C. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.

2.13 SENSING & CONTROLS

A. Level Sensing Transducer

1. Station manufacturer shall supply one submersible pressure transmitter with a full scale (FS) range of 0 to 5 psi with a 2-wire loop powered 4-20mA output. The transmitter shall be PMI model 710-140-00005-009-815-50’ or equal and shall be rated for lift station environment. Transmitter shall be supplied with required mounting hardware.
2. The level sensing transducer(s) shall be a non-fouling design with non-clogging PTFE coated elastomeric diaphragm, specifically designed for adverse environments encountered in wastewater applications.

3. Proof pressure shall be minimum 1.5 x FS and burst pressure shall be 2 x FS;
4. Static accuracy shall be ±0.25% FSO using the BFSL method;
5. Resolution shall be +0.0001% FS;
6. All wetted materials shall be 316 stainless steel or titanium; FKM; PTFE; polyurethane or ETFE – the unit shall have a protection rating of IP 68, NEMA 6P;
7. Thermal error shall be ±-.10% FSO/°C and the compensated temperature range shall be 0°C to 50°C;
8. Input current shall be 20 mA maximum;
9. Output shall be 4-20 mA, 0-5 VDC, 0-2.5 VDC;
10. Capability to re-zero after installation for optimum accuracy and the span shall not be affected;
11. Insulation resistance shall be 100 mega ohm at 50 VDC;
12. The transducer(s) shall be CE compliant (EN 61326-1:2013 and 61326-2-3:2013; UL, CUL and FM compliant – Class I, II, III, Div. 1, Groups A, B, C, D, E, F & G;
13. Cable pull strength shall be a minimum of 200 lb;
14. Cable shall have 4 conductors, each 22 AWG with a molded polyurethane cable seal;
15. Transducer(s) and cable assembly shall be the KPSI 705 as manufactured by TE Connectivity Sensors.
16. The level control system shall be provided with field-adjustable set points for speed reference commands. Setpoint adjustments will be made using the operator keypad on the controller HMI or the mounted touchscreen. The maximum field adjustable setpoint range is 0.0 ft W.C. (4794.20) to 10.0 ft W.C. (4804.20).
17. Upon operator selection of "Automatic", the lead pump shall start when the wet well level rises to the "lead pump start level". *The pump shall start at a prescribed speed and ramp up and down in response to the speed at which the liquid level in the wet well rises or falls. Sensing and responding to the rate of rise and fall of liquid level in the wet well shall be intrinsic to the control system operating protocol.* A rising wet well liquid level will induce the control system to increase the pump speed through control of the VFD typical operating range. A falling wet well liquid level will induce the control system to decrease the pump speed through control of the VFD typical operating range. The lowest VFD range shall be determined by the pump manufacturer such that it will not result in damage to the pump through lack of cooling. When the wet well liquid level reaches the "lead pump stop", the controller shall stop the lead pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise beyond the lead pump maximum VFD frequency, the controller shall start the lag pump when the "lag pump on" level is reached. At this point, the operating pumps shall ramp up until the rpm's match, after which, all pumps shall ramp up and down together in response to the speed at which the liquid level rises or falls. Once the wet well liquid level reaches the "lead pump stop" level,

the controller shall stop all operating pumps and the typical lead pump control scenario shall be re-instituted.

18. The level control system shall activate the “high water alarm” in the event that the liquid level continues to rise to a pre-determined setpoint. The high water alarm shall provide a signal to the package plant control system.

19. The level control system shall alert the operator of a low liquid level in the event the wet well level reaches the preset low water alarm set point where the alarm contact will energize an alarm relay. The controller will flash a low water alarm banner on the HMI screen to indicate such. Low water alarm will also cause interruption of electrical power to all pump motors. Power will be automatically be restored to the motors, without manual reset, when the wet well level rises to the “lead pump on” and the typical lead pump control scenario shall be re-instituted.

20. The level control system shall utilize a primary level-sensing transducer with redundant backup floats for: “lead pump start”; “lag pump start”; “lead pump stop” and “high water level alarm”.

B. Backup Floats

1. A completely independent intrinsically safe backup float alarm system shall be provided. The float system shall provide backup alarm and control functions in the event of high level and low level conditions and shall control the pumps start and stops in the event that the level transducer system fails.

2. Under the backup float operation, pumps shall operate in duplex on/off operational sequence with “Pump On” at HWL and “Pump off” at LWL, while at the same time initiating an alarm condition.

3. Intrinsically safe relays shall be provided for each float. Provide sealed, mercury-free float switches. Provide floats with timer and a sufficient length of cable as required for an un-spliced length. All floats shall have the same length of cable to allow for full height adjustment and interchangeability. Stainless steel float mounting brackets with strain relief grommets shall be provided, to allow for adjustment of the float levels. Floats shall have weighted cable to minimize the effects of turbulence. Additional float wire supports shall be provided to prevent float wires from crossing hatch openings.

2.14 ALARM LIGHT

A. Station manufacturer shall supply one 115 volt AC alarm light fixture with vapor-tight red globe, guard, conduit box and mounting base. The design must prevent rain water from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose for installation by the Contractor.

2.15 ALARM FLASHER

A. The alarm light circuit shall be equipped with a repeat cycle timer causing the alarm light to flash. Flash rate shall be approximately 1 second. (1/2 second on and off).

PART 3 - EXECUTION

3.01 EXAMINATION

A. The Contractor shall off-load lift station components at the installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off- loading, Contractor shall inspect the entire pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in a written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the Engineer and manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. The Contractor shall install, level, align and lubricate all equipment associated with the pump station as indicated on the project drawings, and as outlined in the O&M manual provided with the equipment. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. The Contractor shall install pressure gauges on the suction and discharge lines for the raw pumps.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that all protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.03 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by Owner, an operational test of all pumps, and control systems shall be conducted to verify that the installed equipment meets the purpose and intent of these specifications. Tests shall demonstrate that all equipment provided is electrically, mechanically, structurally, and otherwise acceptable; that it is safe and in optimum working condition; and that it conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed from the wet well, the Contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, discharge gauge readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

3.04 MANUFACTURER’S START-UP SERVICES

A. Coordinate station start-up with the manufacturer's technical representative. The representative or factory service technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures. The pump station warranty is contingent on receipt of a complete start-up report in accordance with specification Section 1.06.E.

3.05 CLEANING

A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.06 PROTECTION

A. The pump station should be placed into service immediately upon completion of field startup. If operation is delayed, the station shall be stored and maintained per the manufacturer's written instructions until it is ready for use.

END OF SECTION 43 25 00

DIVISION 46

WATER & WASTEWATER EQUIPMENT

SECTION 46 53 49
MEMBRANE BIOLOGICAL REACTOR
PRE-PACKAGED WASTEWATER TREATEMENT SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish, deliver, and install a new and complete pre-packaged Membrane Biological Reactor (herein generally referred to as "MBR") system to serve the Flathead Lake Biological Station (FLBS) research station, the campus' 40 cabins and dormitory and Yellow Bay State Park Campground.

B. The system is expected to incorporate an underground primary settling tank for removal of large solids and floatables for periodic removal, an underground flow equalization tank providing storage of one average day of flows, and one underground sludge storage tank for system wasting equipped with a decant function to the EQ tank. The balance of system is to be housed in above ground enclosures including fine screening, pre-anoxic tanks, aeration tanks, post anoxic tanks, MBR tanks, UV units and chemical feed systems able to address carbon dosing, alkalinity adjustment, CIPs, and phosphorus removal. The system shall contain a foam control spray system and a scum removal system.

C. The system will be an automated process incorporating a central control panel with full remote operations and monitoring functions. Instrumentation will include level transducers, flow metering, dissolved oxygen monitoring, mixed liquor concentration monitoring, and turbidity monitoring. Pumps, blowers, sludge wasting, and chemical feed systems must be equipped with flexible controls to accommodate daily and seasonally variable flow rates and minimize energy use, sludge haulage and chemical usage.

D. The system will be capable of handling peak flow rates with full redundancy. System providers are to include installation support, commissioning support, operations training and guarantee the process performance.

E. The system will receive sanitary waste streams via an independent pump station provided by the Owner. Flows from the station can be varied with low extremes during winter months and high peaks during summer months. System suppliers should incorporate mitigation measures into their design to handle these flow fluctuations and the low or high biological concentrations that can accompany such influent flow rates. The system shall be designed so that the configuration prevents short circuiting of the influent. The system's control panel will be configured to directly communicate with the lift station's control panel.

F. The MBR system shall include furnishing and installing the necessary equipment and controls to provide an operating treatment system complete with air diffusion equipment, decant mechanisms, blower systems, air control valves, waste sludge pumps, instrumentation, control panel and Motor Control Center (MCC). The system Seller shall provide installation and start-up assistance training, and guarantee the process performance.

G. The system will be an automated process incorporating a central control panel with full remote operations and monitoring functions. Instrumentation will include level transducers, flow metering, dissolved oxygen monitoring, mixed liquor concentration

monitoring, and turbidity monitoring. Pumps, blowers, sludge wasting, and chemical feed systems must be equipped with flexible controls to accommodate a range of flow rates and minimize energy use, sludge haulage and chemical usage.

H. The system will be capable of handling maximum daily flow rates with full redundancy. System providers are to include installation support, commissioning support, and operations training.

I. It is the intent of these specifications that a single manufacturer-supplier of good reputation, regularly engaged in the design, manufacture, assembly and production of MBR systems of the type specified, shall have complete responsibility for the final design, furnishing, and coordination of all components in the MBR system. As a minimum, the Seller shall be the manufacturer of the: membrane tanks and; control system.

J. The Contractor shall be responsible for providing all equipment, appurtenances, and/or services not identified in the MBR System Supplier's scope of supply, but which are shown on the Contract Drawings or described elsewhere in the Specifications or are necessary for a complete operational MBR treatment system.

K. The Contractor/Manufacturer bidding the project with an alternate Membrane Bioreactor (MBR) manufacturer shall be pre-approved by the Engineer ten (10) calendar days prior to the opening of bids. Pre-approval application shall include a written/signed statement from the MBR manufacturer to the Engineer that states that the equipment provided will meet all Montana Department of Environmental Quality (MDEQ) Design Standards or a Deviation Request will be applied for and granted by MDEQ for any shortcomings. Approval from MDEQ will be required prior to Award of the project, if approval is not granted by MDEQ within thirty (30) calendar days from the date of opening bids the bid will be rejected and the next apparent low bidder will be awarded. All financial costs associated with re-design and MDEQ approval will be the responsibility of the Contractor/Manufacturer, the Owner and Engineer WILL NOT be responsible for any additional financial costs.

Approved Manufacturers:

1. StreamGo.
2. Pre-Approved equal.

1.02 QUALIFICATIONS

A. The MBR System Supplier shall have a minimum of five-year history of designing packaged MBR wastewater treatment facilities. The history shall include a direct successful record of manufacturing packaged MBR systems, servicing packaged MBR equipment and systems specified herein for a minimum of five (5) years. Experience must be direct experience of the MBR System Supplier. Experience related to solely Membrane supply or loose system supply will not be considered. MBR System Supplier shall provide documentation to support the history as noted.

B. In addition to qualifications specified elsewhere in the Contract Documents, the MBR System Supplier have documentation for a minimum five-year history of complete system supply for five (5) operational and representative packaged MBR installations that meet the following MINIMUM criteria in order to be considered qualified:

1. Referenced projects shall:
    a. Have been a pre-engineered package design & complete system supply. Limited supply related to membrane only projects or third-party system supply will not be acceptable.
    b. Have the capability to operate at high mixed liquor suspended solids (greater than 8,000 mg/L).
    c. Have a plant or process train design capacity between 3,000 gallons per day to 125,000 gallons per day.
    d. Utilize similar or comparable headworks (removal efficiencies) and MBR as the proposed system.

1.03 QUALITY ASSURANCE

A. Definitions:

1. MBR System Supplier: The Company responsible for providing all equipment and services as described herein and for providing warranty support.

2. MBR System: A fully inclusive MBR system of equipment, tankage, and controls, pre-engineered to be ready-to-operate once installed and connected on site with site based equipment and instrumentation.

B. Warranty:

1. All equipment and materials will be constructed of new materials

2. All equipment and materials will carry a warranty of 24 months after the project is substantially complete and final acceptance of the equipment has been granted.

3. Supplied membrane elements will be supplied with a manufacturer warranty of not less than 5 years.

C. System Guarantee:

1. 7-day performance test:

    a. Demonstrate that the system will meet the effluent quality requirements over a 7-day performance test.

    b. Scheduled after the system has started-up and had sufficient time for biological stabilization.

    c. All analytical testing will be the responsibility of the purchaser and performed under the following conditions:

        i. Influent water quality parameters are met.

ii. The system has been operated properly according to the provided operation and maintenance manual.

d. All equipment appurtenant to the MBR (screen; UV; odor control; chemical feed; etc.) shall be demonstrated to achieve their individual performance measures as intended.

1.04 SUBMITTALS

A. MBR System supplier shall submit BioWin ^{TM} treatment simulations demonstrating treatment objectives can be achieved at average day flows and peak flows and loading conditions. The simulations shall verify basin volumes, recycle rates, aeration requirements, chemical dosing requirements, and solid waste projections. This model shall be based on the Owner supplied influent mass loading, average and peak flows and loading, and target effluent limits included in Section 1.05 below. The bidder shall provide a written report summarizing the modelling results, as per Section 01 33 00 – Submittals.

B. Shop Drawings:

1. 3D general arrangement drawings of the package plant (.dwg)
2. Schematic control diagrams
3. Electrical panel drawings
4. P&ID drawings (.dwg)
5. Control narrative
6. Equipment cut sheets
7. Plant layouts and sized based on system submitted
8. Construction section drawings for underground works

C. Factory Testing

1. Control panel input/output verification
2. UL certification of assembled units
3. Tank water testing
4. Piping air tests

D. Operation Manuals

1. Two hard copies bound in 3-ring binders.
2. Two digital copies on USB thumb drives.

1.05 PRE-PACKAGED MBR SYSTEM DESIGN

A. Turn-key fully automated MBR system

B. Design requirements:

1. Influent wastewater general characteristics:

Parameter	Value	Unit
Ave. Day Flow	5,513	gpd
Max Month	10,439	gpd
Peak Day	20,878	gpd
Avg. BOD Load	10.12	lb/d
Avg. TSS Load	33.10	lb/d
Avg. TP Load	0.37	lb/d
Avg. TN Load	1.84	lb/d
Alkalinity	220	mg/l
WW Temperature	>10	℃
FOG	<10	mg/l

2. Effluent quality requirements:

Parameter	Value	Unit
BOD_5 (30-day Ave)	30	mg/l
BOD_5 (7-day Ave)	45	mg/l
TSS (30-day Ave)	30	mg/l
TSS (7-day Ave)	45	mg/l
E.coli (30-day Ave)	32	#/100 ml
E.coli (daily max.)	50	#/100 ml
Total Nitrogen	<9.18	mg/l
Total Nitrogen	154	lb/yr
Total Phosphorus	<0.12	mg/L
Total Phosphorus	2	lb/yr
Max Effluent Cl	0.02	mg/L

C. The Bidder can assume that the MBR influent wastewater does not contain any threshold concentration of toxic or priority pollutants that are inhibitory to biological treatment processes. A list of these threshold concentrations as published by the United States Environmental Protection Agency, can be found at: https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act.

1.06 MBR PROCESS DESIGN

A. The MBR system design, which utilizes the process parameters described in this specification, must provide the ability to operate with dependability, while maintaining F/M ratios and cell residence time within the endogenous respiratory phase of the biomass. This capability is critical in order to maintain compliance during significant seasonal fluctuations in flow/load.

1.07 SUMMARY

A. Primary settling tank

B. Flow equalization tank with associated pumps, level controls, and aeration

C. Pre-package MBR housed in lined and insulated enclosure complete with lighting, ventilation, and heating

1. Influent minimum 2mm fine screens (full redundancy for peak flows)
2. Polyethylene or stainless anoxic tank with mixer and level monitoring
3. Polyethylene or stainless aerobic tank with aeration diffusers and blowers (full redundancy average day flows) with level monitoring.
4. Two (2) parallel membrane tanks with membranes and associated blowers, permeate pumps, level monitoring, and wasting valves (full redundancy for peak flow rates).
5. UV disinfection units (full redundancy for peak flow rates).
6. Return activated sludge pumps.
7. Permeate/CIP tank.
8. Chemical dosing systems to support carbon dosing, alkalinity adjustments, phosphorus removal and membrane cleaning processes.
9. Foam control spray system.
10. Scum removal system.
11. Instrumentation for system operation and monitoring.

D. Sludge holding tank with decant operation

1.08 SYSTEM PERFORMANCE REQUIREMENTS

A. MLSS Range: 6,000 to 10,000 mg/L

B. Membrane filtration will be pump driven

C. Membrane Operating Cycle: 7-10 minutes run time, 1 minute backpulse or relax

D. Membrane flux at the maximum daily flow with full redundancy: <10 gal/ft^2 membrane surface/day

PART 2 - EQUIPMENT

2.01 PRIMARY SETTLING TANK (PST)

A. The primary settling tank serves to collect floatable and settleable solids including grit from associated collection system and structures. The primary settling tank will be designed to meet Montana DEQ standards for settling list in DEQ-2.

B. The tank will be a precast concrete structure capable of burial depths for frost protection.

C. The tank will be equipped with Zabel or equivalent outlet filters with overflow protection.

D. The PST tank shall have access hatch(es). The access hatch is to be aluminum in construction and of adequate size to accommodate maintenance activities and access ladder. The hatch(es) must be lockable. The hatch(es) must be watertight.

E. The PST tank shall have a candy cane style vent with a carbon filter to mitigate odors.

F. The tank shall include rubber-gasketed joints.

G. The tank shall utilize resilient pipe connectors cast or fitted into the walls for each pipe connection. Gravity pipes will be permitted to use linkseal fittings.

H. The tank must meet ASTM C913, ASTM C1227, ASTM C90, and ACI-318 standards.

I. The tank must be H20 load rated.

J. The tanks must be NPCA and PCI certified.

K. Approved Manufacturers:

1. Crest Precast, Inc.
2. Pre-Approved equal.

2.02 FLOW EQUALIZATION TANK (EQ)

A. The flow equalization tank provides short term storage for peaking flows and during maintenance operations in downstream structures.

B. The EQ tank will be sized for eight (8) hours of storage at average day flow.

C. The EQ tank will be pre-cast concrete construction capable of burial depths for frost protection and be supplied with pipe penetration corings complete and with link-seals.

D. The EQ tank will be equipped with two access hatches. The primary pump access hatch is to be aluminum in construction and of adequate size to accommodate duty and stand-by pump removal system and access ladder. The hatches must be lockable. The hatches must be watertight.

E. Submersible EQ pumps will be supplied in duty/stand-by format with associated bases, removal rail system, anchors, isolation valves, check valves and associated electrical disconnects.

F. The EQ tank will be equipped with aeration diffusers and blower to maintain aerobic conditions.

G. The EQ tank will be equipped with pressure transducer level monitoring and float back-ups for operation and alarm functions.

H. The EQ tank will be supplied with mountable base and manual jib crane for servicing pumps as needed.

I. The EQ tank shall have a candy cane style vent with a carbon filter to mitigate odors.

J. The tank shall include rubber-gasketed joints.

K. The tank shall utilize resilient pipe connectors cast or fitted into the walls for each pipe connection. Gravity pipes will be permitted to use linkseal fittings.

L. The tank must meet ASTM C913, ASTM C1227, ASTM C90, and ACI-318 standards.

M. The tank must be H20 load rated.

N. The tanks must be NPCA and PCI certified.

O. Approved Manufacturers:

1. Crest Precast, Inc.

2. Pre-Approved equal.

2.03 PRE-PACKAGED MEMBRANE BIOREACTOR

A. MBR will be packaged within a lined and insulated enclosure (R12) incorporating service hatches, man doors, heating, ventilation, lighting, and power distribution equipment to support a 208V, 3-Phase, 60Hertz service. Service hatches to support future replacement and servicing of all equipment, membranes, and tanks.

B. MBR shall have electrical receptacles on the exterior of the containers for maintenance related activities. There shall be at least 2 receptacles located between the containers.

C. MBR mechanical connections will be accommodated through the floor of the enclosure to eliminate risks of freezing.

D. Fine Screens will come equipped with 2mm screening and an automated cleaning and pressure differential monitoring system. Duty and stand-by units will be sized for peak pump flows of EQ pumps.

E. Aeration tank will be of polyethylene, HDPE or stainless steel construction and equipped with air diffuser system, blowers with VFD controls, air flow monitors, dissolved oxygen sensors, MLSS monitor, pressure transducer for level control, back-up floats for both operational and alarming functions, and adequate ventilation to exterior of enclosure.

F. MBR feed pumps shall be centrifugal supporting permeate and return activated flows and supplied in duty/stand-by arrangement allowing servicing while system remains live.

G. MBR tanks will be constructed of stainless steel with stainless steel cassette frames. Two (2) independent tanks will provide housing and functions of membrane elements supporting peak flow rates individually for full redundancy. Number of membranes will be determined using a flux rate of 10 gal/ft2/day at 10 degree C or lower if recommended my membrane manufacturer. Each tank will be provided with supporting Clean in Place (CIP) systems including backpulsing, biological cleans and de-scaling practices. Membrane operations will be supported with membrane manufacturer recommended flushing and air scour systems. Each MBR tank will be equipped with a power actuated valve for automated wasting.

H. MBR tanks shall have foam control spray nozzles to control the production and accumulation of foam.

I. Permeate pumps will be sized and piped to provide peak hourly flow rates with redundancy on each individual tank. Each pump will be provided with VFD controls to adjust plant treatment rates based on influent flow rates.

J. UV units will be provided to meet peak hourly demand flow rates with redundancy and meeting state disinfection standards.

K. Instrumentation will include:

1. Electromagnetic flow meters for operation of MBR process and discharge.

2. Tank level indication pressure transducers with back-up floats.
3. Dissolved oxygen sensors with cleaning option for each aeration tank.
4. PH/Temperature probe
5. TSS/MLSS monitoring system for automated wasting function.
6. Transmembrane pressure monitoring sensor.
7. Air flow meters for confirmation of air supply and associated alarming.

L. Main control panel will house system main disconnect, central PLC, HMI, VFD's, Contactors, fusing, modem, remote access, back-up power pack to support PLC power down. Back-up PLC will be provided with programming for emergency operation.

M. The main control panel shall connect to the lift station dual pump control panel (influent & effluent) and be able to control the lift station pumps from the MBR package plant containers and remotely. Liquid level monitoring for the lift station wet-wells shall be available in the MBR package plant and accessed remotely.

2.04 SLUDGE HOLDING TANK

A. The sludge storage tank will store wasted activated sludge for decanting and off-site disposal.

B. The sludge storage tank will be equipped with a decant function that will allow manual decant of clarified liquids back to the flow equalization tank at the front of the system.

C. The sludge storage tank sizing will support 20 days of decanted waste.

D. The sludge tank will be constructed of concrete materials with a suitable load rating to support required burial depths for frost.

E. The sludge tank shall have access hatch(es). The access hatch is to be aluminum in construction and of adequate size to accommodate maintenance activities and access ladder. The hatch(es) must be lockable. The hatch(es) must be watertight.

F. The sludge tank shall have a candy cane style vent with a carbon filter to mitigate odors.

G. The tank shall include rubber-gasketed joints.

H. The tank shall utilize resilient pipe connectors cast or fitted into the walls for each pipe connection. Gravity pipes will be permitted to use linkseal fittings.

I. The tank must meet ASTM C913, ASTM C1227, ASTM C90, and ACI-318 standards.

J. The tank must be H20 load rated.

K. The tanks must be NPCA and PCI certified.

L. Approved Manufacturers:

1. Crest Precast, Inc.
2. Pre-Approved equal.

2.05 SAMPLING

A. Composite samplers will be provided for influent and effluent sampling.

2.06 FLOW MEASUREMENT

A. Flow measurement will be provided (at a minimum) for the following parameters to meet DEQ standards:
   1. Influent
   2. MBR
   3. RAS
   4. Recirculation
   5. Recycle
   6. Effluent

B. See specification 40 71 13 – Magnetic Flow Meter and Transmitter

PART 3 - EXECUTION

3.01 BIOLOGICAL PROCESS PERFORMANCE GUARANTEE

A. Seller shall provide a Process Performance Guarantee to the Buyer, guaranteeing the MBR process shall meet effluent wastewater quality, as determined during the Performance Test. Performance testing shall occur during the first year of operation and shall include consideration of the variation in hydraulic and organic loading and the influence of weather conditions as they impact process performance. Demonstration of plant performance capability at design conditions shall be simulated. Performance testing shall be completed with the one-year operational services provided under Paragraph 3.07 of this section.

B. The full Process Performance Guarantee language and details of the Performance Test; defining conditions of guarantee, manufacturer's responsibilities, Owner responsibilities, testing protocol, sampling, and analysis shall be provided with the Equipment Submittal.

C. The Seller shall guarantee that the MBR process shall meet effluent wastewater quality, as determined during the Performance Test equal to or better than the effluent quality as defined in Section 1.05.B.2 Effluent Quality Requirements found above.

3.02 FACTORY ACCEPTANCE TESTING

A. Prior to shipment, the MBR System Supplier shall coordinate and conduct a system factory acceptance test (FAT) of the complete MBR System.

B. The PLC control logic and HMI operability shall be demonstrated by systematically forcing I/O to verify all controls functions and HMI screen representations defined in the system control narrative

C. The MBR control panel shall be inspected for completeness, and workmanship.

D. The system shall be completely connected including ancillary equipment, all interconnecting piping, interconnecting electrical and interconnecting communications. Wet test of the system with a complete hydraulic run through demonstrating the functionality of all pumping and blower subsystems shall be performed.

E. The MBR System Supplier shall furnish all materials, instruments, and incidental and expendable equipment required for Acceptance Testing of the MBR System, except where otherwise specified.

F. The Owner or an authorized representative of the Owner may be present to witness the Acceptance Testing.

G. The MBR System Supplier shall keep detailed notes regarding the FAT and record all test data and results. Upon successful completion of the Acceptance Testing, the Supplier shall submit a written report on the FAT to the Engineer for approval.

3.03 DELIVERY/STORAGE/HANDLING

A. All equipment shall be delivered directly to the site, the cost of which shall be prepaid by Supplier and added to the final invoice.

B. All equipment deliveries shall be accompanied with a parts list listing the part description and its corresponding parts number. All parts shall be packaged and listed separately. The part number shall be written on the package, crate, or container.

C. All equipment and components shall be furnished as complete assemblies with all internal wiring, piping, valving and control devices. Items shall be delivered as complete assemblies except where partial disassembly is required by transportation regulations and for protection of components.

D. The Supplier shall contact the Contractor at least two (2) weeks prior to the date the equipment is scheduled to be shipped.

E. The Supplier shall make available, upon the request of the Contractor, personnel to assist in the inspection of the Supplier's equipment upon unload at the site. Supplier's personnel shall provide services in accordance with their standard daily rates.

3.04 INSTALLATION

A. The MBR System Supplier shall coordinate with the Contractor, Engineer, and Owner for execution of the System Commissioning. In advance of System Commissioning the MBR System Supplier shall perform an onsite Mechanical Inspection of the facility and generate a punch list of inconsistencies. The Contractor is required to resolve the punch list items to the satisfaction of the System Supplier, prior to scheduling System Commissioning. The MBR manufacturer shall issue the Contractor a *Manufacturer's Certificate of Inspection* verifying that the equipment has been installed in complete conformance with the manufacturer's requirements.

B. The MBR System Supplier shall prepare a "Detailed Plan of Commissioning Activities" that will be used as a guideline for Commissioning of all MBR equipment provided by the Supplier. The Detailed Plan of Commissioning Activities shall be used to coordinate the activities of the Supplier's and Owner's personnel. The "Detailed Plan of Commissioning Activities" will identify the Commissioning requirements for all equipment supplied by the MBR System Supplier

C. The equipment shall be installed in accordance with the manufacturer's instructions

D. Align and adjust equipment in accordance with manufacturer's recommendations

E. Complete tank integrity water testing and pressure testing of piping systems prior to backfill of site installed infrastructure.

F. The Contractor shall provide materials and personnel in support of the System Commissioning to fill tanks with clean water, transfer fluids, repair/remedy any and all electrical and mechanical issues, provide temporary tie-ins, temporary piping, transfer pumps, etc.

G. The Contractor and manufacturer are responsible for monitoring operating conditions and performance during the Commissioning Period.

H. The Contractor shall coordinate with the Engineer and Owner to seed the MBR system with sludge. The Contractor is responsible for supplying and transporting the seed sludge.

I. The System Commissioning shall begin at the Contractor's discretion, within the limits defined herein:

1. Only after successful completion of a pre-commissioning Mechanical Inspection conducted by the MBR manufacturer, contractor, electrician and engineer

2. Commissioning and startup shall be no later than 30 days after completion of the Mechanical Inspection.

J. The Contractor shall operate the plant during the Commissioning Period; however, Supplier and Owner shall be allowed onsite.

K. The Contractor is responsible for monitoring operating conditions and performance during the Commissioning Period.

L. The MBR Supplier shall place the equipment into operation and perform tests to determine if equipment is operating properly. The purpose of these tests is to verify that both the System and each Unit are:

1. Properly installed

2. Operational

3. Capable of completing an operating cycle free of problems

4. Free from pump or valve cavitation, water hammer, overheating, overloading, vibration, or other operating problems.

5. The MBR System Supplier shall verify that control programming has been configured with appropriate software time delays to avoid rapid pump or membrane flow cycling in response to transient dynamic hydraulic effects caused by backwash, or chemical washing cycles or other process cycles (e.g. start -up, shut down, membrane test). "Dead-heading" or any operation of any pump under a "zero-flow" or "flow condition below the pump manufacturers acceptable limits" is not acceptable. Interlocks shall be provided to prevent operation of the any pump under a

"dead- headed" condition. The pump manufacturers “maximum number of pumps starts per hour" shall not be exceeded.

M. As a part of commissioning, the MBR System Supplier shall start-up and operate all support systems provided by or required by the Supplier for operation of the system, including but not limited to chemical feed systems, instrumentation, air compression equipment, and electric controls. This testing shall demonstrate that there are no water or air leaks in the system, that the piping has been installed and connected properly, that the electrical system is operating correctly, and that the instrumentation has been properly calibrated.

1. All water bearing units must be hydraulically tested. The allowable leakage rate for concrete water containment structures, with a side water depth of 25 feet or less, must not exceed 0.1 percent of the water volume in a 24-hour period following stabilization and must not show any visible leakage or dampness on the exterior walls. Test procedures and results must be submitted to the Engineer and DEQ for approval.

2. All plastic, steel, non-concrete tanks/water bearing units shall have zero leakage for a 24-hour period when hydraulically tested. Test procedures and results must be submitted to the Engineer and DEQ for approval.

N. Membrane permeate quality shall be evaluated to determine compliance of the MBR System with Performance Requirements. If the MBR system fails to comply with requirements of membrane permeate quality, Supplier shall provide the Owner and the Engineer a written plan of modifications to the system (such as repairing damaged fibers, replacing seals, complete replacement of system) to achieve compliance with the requirements. Upon implementation of modifications plan, the permeate quality tests shall re-commence in their entirety.

O. When requested by the MBR System Supplier, the Engineer shall review the operation of the equipment to verify that the commissioning is complete.

1. The Engineer shall perform random tests on equipment and witness various operational sequences to confirm general conformance to the Contract Documents

2. The Engineer shall initiate alarm conditions and perform random tests on the control system to confirm general conformance to the Contract Documents.

3. The Engineers review shall include a review of the HMI interface and PLC SCADA system commissioning requirements to determine conformance with, Membrane Bioreactor Equipment specifications and requirements of the Project The Engineers review shall identify any equipment that has not been properly installed, or operating, detailing the outstanding installation issues on a "punch list" and noting the party who shall be responsible for each correction and identify the items require that correction.

4. Upon satisfactory completion of the review, the Engineer shall submit to the MFEM a written "Notice of Completed Commissioning.

P. Once the "Notice of Completed Commissioning" is issued, Training of Operation and Maintenance Personnel may commence.

3.05 TANK LEAKAGE TESTING

A. Tanks shall all be leakage tested according to specification 03 30 00. The tests shall be completed in accordance with ACI 350.1.

3.06 START-UP AND TRAINING SERVICES

A. Provide the services of a manufacturer's field representative to advise on the wastewater treatment plant field installation.

1. Duration: A minimum of ten (10) days, exclusive of travel time, over two (2) trips during the time equipment is being installed.

2. Notify the manufacturer a minimum of ten (10) working days prior to the time that the field services are desired.

B. Notify the manufacturer when the installation of the wastewater treatment plant equipment has been completed.

1. A representative of the supplier shall inspect the installation.

2. Manufacturer shall advise the Contractor, Owner, and Engineering in writing of any corrections or adjustments that are required for the wastewater treatment plant equipment installation.

C. Field Services: Provide services of a manufacturer authorized field representative upon receipt of notification from the Contractor certifying that the wastewater treatment plant installation is ready for start-up.

1. Duration: A minimum of thirty (30) days, exclusive of travel time over (3) trips during the time that the equipment is being commissioned.

2. Timing of trips shall be coordinated with Owner and Engineer.

3. The field person shall do a functional check of each item furnished by the manufacturer and start-up of the process.

4. During this time, the field representative will provide not less than forty (40) hours of operation training for the Owner's personnel which shall include familiarization with the wastewater treatment plant process, its requirements, and review of the Operation and Maintenance Manuals.

3.07 OPERATION AND MAINTENANCE MANUAL

A. Two (2) bound (3 ring binder) paper copies and two (2) USB drives with complete electronic copies of the Operation & Maintenance Manuals shall be furnished during start-up. These manuals shall include maintenance instructions for all equipment provided.

B. Operation & Maintenance Manual shall include a Functional Design Specification (description of control software logic) and Operational Description (description of process).

3.08 PREVENTATIVE AND OPERATIONAL MAINTENANCE SERVICES

A. Provide preventative maintenance services for the first year of operation after the warranty period is initiated.

B. Onsite services

1. Provide two site visits during the first year of operation.
2. Site visits shall consist of one day onsite and be coordinated between the Buyer and Seller a minimum of ten working days prior to the time that the field services are desired.
3. Site visits shall be completed by a qualified biological process engineer experienced in the MBR processes.
4. Site visits shall include the following services:
    a. Review of process performance during variable loading and climatic conditions
    b. Collection of performance data with summary in a report.
    c. Visual check of bubble patterns in each basin/grid
    d. Retrieve and assess on-site pressure monitoring readings
    e. Examine supplied pipework and associated joints – perform leak and level testing.
    f. Perform laboratory or field testing of diffuser dynamic wet pressure
    g. Inspection and assessment of supplied instrumentation
    h. Refresher process training
    i. Review of biological process operating data and effluent requirements
5. Upon completion of the onsite inspection a complete written report shall be provided detailing energy and process assessments and recommendations

C. Remote services

1. Provide remote access via modem for PLC/SCADA troubleshooting or programing changes
2. Provide a loaner pre-programmed PLC processor overnight in the case of PLC hardware failure
3. Provide remote process support and troubleshooting including review of operating data and control strategies
4. Provide remote reporting modifications and changes
5. Provide electrical and mechanical phone support 24 hours per day, 7 days per week.

3.09 MECHANICAL WARRANTY AND PERFORMANCE GUARANTEE

A. Seller shall furnish its standard warranty against defects in material and workmanship for all Equipment provided by Seller under this Section. Manufacturer shall guarantee all equipment furnished to be free from defects in materials and workmanship under normal

use and service for a period of twenty (24) months after the project is substantially complete and final acceptance of the equipment has been granted.

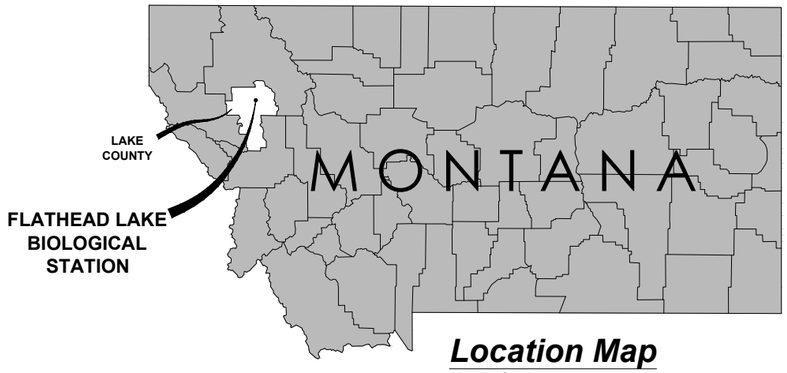
END OF SECTION 46 53 49

APPENDICES

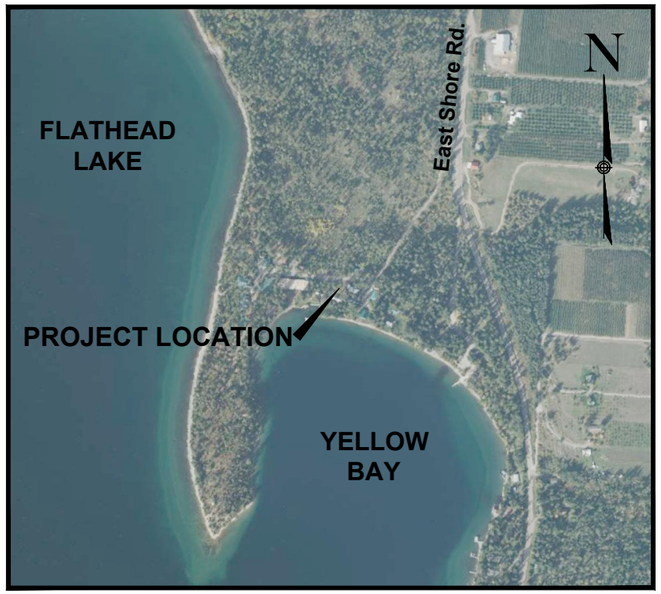
APPENDIX A

Project Drawings

Flathead Lake Biological Station
Replace Sewer Treatment System
Yellow Bay, MT
A/E #2016-01-01-02



Location Map
Not To Scale



32125 Bio Station Ln. Polson, MT 59860

WORKSCOPE

Install New Influent & Effluent Pumps, Rehabilitate the Existing Lift Station Building, New MBR Package Treatment Facility, Forcemain & Gravity Piping Extension to the MBR Facility, New Water Service to the MBR Facility, Asphalt Access Road & Parking Area, New Gravel Access to Zoology, and a New Emergency Generator.

PROJECT DESIGN TEAM

ANDERSON MONTGOMERY CONSULTING ENGINEERS
KINGDOM BUILDERS ENGINEERING, INC.

PRIMARY CONTACTS

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MONTANA ADAM ECKHART 20032PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Cover**

Sheet: **G-1**

Flathead Lake Biological Station

Replace Sewer Treatment System Design Sheet List

General	
G-1	Cover
G-2	Index
G-3	Legend
G-4	Abbreviations & Notes
G-5	Design Criteria
G-6	Process Flow Diagram
G-7	Hydraulic Profile
G-8	Geotechnical Borehole Locations

Piping and Instrumentation Diagram	
PID-1	P&ID Symbols and Legend
PID-2	Underground Civil Works Flow Diagram
PID-3	Blower Flow Diagram
PID-4	Chemical Flow Diagram
PID-5	MBR Building Flow Diagram
PID-6	Biological Building Flow Diagram Part 1
PID-7	Screening Flow Diagram
PID-8	Biological Building Flow Diagram Part 2

Civil	
C-1	Location and Survey Control Coordinates
C-2	Site Plan
C-3	Grading Plan
C-4	Facility Elevation Point Plan
C-5	Concrete Sidewalk Site Plan
C-6	Concrete Sidewalk Sections
C-7	Asphalt Site Plan
C-8	Zoology Gravel Access Plan
C-9	Sewer Extension Plan & Profile
C-10	Forcemain LS to PST Plan & Profile
C-11	New Water Service
C-12	Demolition Plan
C-13	Manufacturer's Supplied Equipment

Civil Details	
CD-1	Manhole Details
CD-2	Civil Details
CD-3	Civil Details
CD-4	Pipe Support Details
CD-5	Civil Details
CD-6	Subgrade Civil Details
CD-7	Civil Details
CD-8	Civil Details

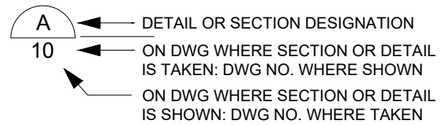
Lift Station	
LS-1	Demolition Plan View
LS-2	Demolition Section Views
LS-3	Lift Station Plan Views
LS-4	Lift Station Section View
LS-5	Lift Station Section View
LS-6	Lift Station Details

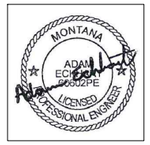
Electrical	
E-1	Electrical Symbols & Legends
E-2	Electrical Site Plan
E-3	Treatment Facility Electrical Plan
E-4	Lift Station Electrical Plan
E-5	Electrical Schedules
E-6	Electrical Riser Diagram
E-7	Electrical Details

DRAWING IDENTIFICATION SYSTEM:

LETTER	DISCIPLINE
G	GENERAL
PID	PIPING AND INSTRUMENTATION DIAGRAM
C	CIVIL
CD	CIVIL DETAILS
LS	LIFT STATION
E	ELECTRICAL

DETAIL DESIGNATION:





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Sheet Title: **Index**

Sheet: **G-2**

PIPE AND FITTING SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		EXISTING PIPE (SCREENED)
		NEW PIPE
		EXISTING PIPE TO BE ABANDONED
		EXISTING PIPE TO BE REMOVED
		WELDED JOINT
		GROOVED END JOINT (FLEXIBLE)
		GROOVED END JOINT (RIGID)
		GROOVED END FLANGE
		FLANGED JOINT
		FLANGE COUPLING ADAPTER
		MECHANICAL COUPLING
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		UNION
		BLIND FLANGE
	E	CAP
		CROSS
		TEE
		ELBOW, 45°
		LATERAL (WYE)
		ELBOW, 90°

VALVE SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		GLOBE
		GATE
		BALL
		PLUG
		BUTTERFLY
		DIAPHRAGM
		PINCH
		SWING CHECK
		DOUBLE DISK CHECK
		BALL CHECK

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		SAMPLE VALVE NO THREAD OUTLET
		HOSE VALVE
	X	NON FREEZE HOSE VALVE, X=NO IN SPECS
	X	NON FREEZE HOSE VALVE, X=NO IN SPECS
	S	SAMPLE
		PRESSURE RELIEF
		SURGE CONTROL
		AIR/VACUUM
		REGULATED SIDE PRESSURE REDUCING
		PRESSURE REDUCING VALVE
		FLOW CONTROL VALVE / NEEDLE VALVE

CIVIL SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
CONCRETE		
GRAVEL		
PAVEMENT		
CURB AND SIDEWALK		
PROPERTY LINE		
EASEMENT		
RIGHT OF WAY		
GRAVEL ROAD		
CONTOURS	4200 4198	4200 4198
DRAINAGE		
WATER	12"W	W
WATER SERVICE LINE		
WATER SERVICE	S	
SANITARY SEWER		SS MH
STORM DRAIN		
FENCE LINE (BARB WIRE)		
FENCE LINE (CHAIN LINK)		
SIGN		
OVERHEAD POWER	OHPWR	
UNDERGROUND FIBER OPTIC	FO	
UNDERGROUND TELEPHONE, PEDESTAL	T	
UNDERGROUND GAS	GAS	
UNDERGROUND POWER, TRANSFORMER	PWR	
CONTROL WIRE CONDUIT	CTRL	
AIR LINE		
FORCEMAIN	FM	
POTABLE WATER	W	
SEWER MAIN	S	
STREAMGO EQUIPMENT		

DOUBLE LINE	SINGLE LINE	DESCRIPTION
CABLE TV	TV	TV
CURB		
DRAINAGE DITCH		
ROAD		
BUILDING		
DROP INLET		
EASEMENT PIN		
POWER POLE		
POWER POLE WITH GUY WIRE		
LIGHT POLE		
SURVEY POINT		
CONTROL POINT	CP	CP
TELEPHONE PED	PED	PED
TELEPHONE BOX		
ELECTRICAL BOX		
CURB BOX, SIGN		
DRILL HOLE OR TEST PIT	DH1 TP1	DH1 TP1
CATTLE GUARD		
SECTION CORNER		
QUARTER CORNER		
FROST FREE HYDRANT		
HOSE BIB		HB
FROST FREE HOSE BIB		FF HB

NOTES:

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- THIS IS A STANDARD LEGEND SHEET. THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET AND MAY NOT BE UTILIZED ON THIS PROJECT.

MONTANA ADAM ECKHART COOPE LICENSED PROFESSIONAL ENGINEER

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Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Legend

Sheet
G-3

ABBREVIATIONS:

ø	DIAMETER
@	AT
AA	ALL AROUND
AB	ANCHOR BOLT, AGGREGATE BASE
AC	ASBESTOS CEMENT OR ACRE
AFF	ABOVE FINISHED FLOOR
ADA	AMERICANS WITH DISABILITIES ACT
AH	AHEAD
AL	ALUMINUM
ANC	ANCHOR
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATELY
ARV	AIR RELEASE VALVE
AVE	AVENUE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BC	BUILDING CORNER
BF	BLIND FLANGE
BFF	BELOW FINISH FLOOR
BFV	BUTTERFLY VALVE
BGS	BELOW GROUND SURFACE
BK	BACK
BLDG	BUILDING
BLVD	BOULEVARD
BM	BENCH MARK
BOC	BACK OF CURB
BOD	BIOCHEMICAL OXYGEN DEMAND
BV	BALL VALVE
BVC	BEGIN VERTICAL CURVE
C	CHANNEL OR CENTER
CARV	COMBINATION AIR RELEASE VALVE
CATV	CABLE TELEVISION
CF	CUBIC FEET
CFS	CUBIC FEET PER SECOND
CI	CAST IRON OR CURB INLET
CIP	CAST IRON PIPE OR CAST-IN-PLACE
CIPP	CURED-IN-PLACE PIPE
CL	CENTERLINE
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
CONC	CONCRETE
COS	CERTIFICATE OF SURVEY
CP	CONTROL POINT
CPE	CORRUGATED POLYETHYLENE PIPE
CPLG	COUPLING
CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CORRUGATED STEEL PIPE
CV	CHECK VALVE
CY	CUBIC YARDS
C1D1	CLASS 1 DIVISION 1
DEC	DECANT
DEMO	DEMOLISH
DEPT	DEPARTMENT
DH	DRILL HOLE (SOIL BORING)
DI	DUCTILE IRON OR DRAIN INLET
DIA	DIAMETER
DIMJ	DUCTILE IRON MECHANICAL JOINT
DIP	DUCTILE IRON PIPE
DL	DRAIN LINE
DR	DRAIN OR DIMENSION RATIO
DWAS	DIGESTED WASTE ACTIVATED SLUDGE
DWG	DRAWING
EA	EACH
EFF	EFFLUENT
ELEV	ELEVATION
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
EOS	EDGE OF SIDEWALK
EPDM	ETHYLENE PROPYLENE DIENE M-CLASS RUBBER
EVC	END VERTICAL CURVE
EW	EACH WAY
EXT	EXTERIOR
EXIST	EXISTING
FAB	FABRICATION
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FDN	FOUNDATION
FETS	FLARED END TERMINAL SECTION
FF	FINISHED FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOOR, FLANGE OR FLOW LINE
FOC	FACE OF CURB OR FACE OF CONCRETE
FM	FORCE MAIN
FPT	FEMALE PIPE THREAD
FS	FINISHED SURFACE
FTG	FOOTING
FT	FOOT OR FEET
G	GAS
GA	GAUGE
GALV	GALVANIZED
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GPS	GLOBAL POSITIONING SYSTEM, GALLONS PER SECOND
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE
HD	HEAVY DUTY OR HOT-DIPPED
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDR	HEADER
HGT	HEIGHT
HP	HORSEPOWER
HT	HEIGHT
HWY	HIGHWAY
HYD	HYDRANT
I&C	INSTRUMENTATION & CONTROL
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IN	INCH
INFL	INFLUENT
INT	INTERIOR OR INTERSECTION
INV	INVERT
JT	JOINT
K	KILOMETER
KW	KILOWATT
L	ANGLE, LONG
LB(S)	POUND(S)
LD	LOCAL DISCONNECT
LEB	LARGE END BELL
LF	LINEAL FOOT OR LINEAR FEET
LT	LEFT
MAX	MAXIMUM
MC	MECHANICAL COUPLING
MCC	MOTOR CONTROL CENTER
MDT	MONTANA DEPT. OF TRANSPORTATION
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM OR MINUTE
MJ	MECHANICAL JOINT
MPT	MALE PIPE THREAD
MPWSS	MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS
MTL	MATERIAL
MWS	MAXIMUM WATER SURFACE
N	NORTH
NEC	NATIONAL ELECTRICAL CODE
N.I.C.	NOT IN CONTRACT
NO.	NUMBER
NPT	NATIONAL PIPE THREAD
NPW	NON-POTABLE WATER
NTS	NOT TO SCALE
OAL	OVERALL LENGTH
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE OR OVERFLOW
OHP	OVERHEAD POWER
PC	POINT OF CURVATURE
PE	PLAIN END
PH	PHONE
PI	POINT OF INTERSECTION
PL	PROPERTY LINE OR PLATE
PLCS	PLACES
PROP	PROPERTY OR PROPOSED
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH, GAUGE
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE PLASTIC
PVI	POINT OF VERTICAL INTERSECTION
PWR	POWER
R	RADIUS
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RCPA	REINFORCED CONCRETE PIPE ARCHED
RDCR	REDUCER
RFC	ROTATED FOR CLARITY
ROW	RIGHT-OF-WAY
RPA	ROBERT PECCIA & ASSOCIATES
RPC	RED PLASTIC CAP
RPP	REINFORCED POLYPROPYLENE
RR	RAILROAD
RT	RIGHT
RW	RIGHT-OF-WAY OR RACEWAY
R/W	RIGHT-OF-WAY
RWL	RAIN WATER LEADER
S	SLOPE
SBB	SLUDGE BUFFER BASINS
S/C	SERVICE CONNECTION
SCH	SCHEDULE
SD	STORM DRAIN
SDI	STORM DRAIN INLET
SDR	STANDARD DIMENSION RATIO
SEB	SMALL END BELL
SECT	SECTION
SF	SQUARE FOOT/FEET
SIM	SIMILAR
SQFT	SQUARE FOOT/FEET
SS	SANITARY SEWER OR STAINLESS STEEL
SSMH	SANITARY SEWER MANHOLE
SSP	SPIRAL STEEL PIPE
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL OR STEEL PIPE
SUPER	SUPERNATENT
SY	SQUARE YARDS
T	TELEPHONE
TBC	TOP BACK OF CURB
TBLAY	TOP BACK OF LAYDOWN CURB
TBM	TEMPORARY BENCH MARK
TDW	TREATED DISINFECTED WATER
TEMP	TEMPERATURE OR TEMPORARY
THD	THREAD
TOA	TOP OF ASPHALT
TOC	TOP OF CONCRETE
TOG	TOP OF GRATE
TOS	TOP OF SIDEWALK
TOW	TOP OF WALL
TP	TEST PIT
TS	TECHNICAL SPECIFICATIONS
TV	CABLE TELEVISION
TW	TREATED WATER
TWAS	THICKENED WASTE ACTIVATED SLUDGE
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UG	UNDERGROUND
UGP	UNDERGROUND POWER
UPC	UNIFORM PLUMBING CODE
V	VENT, VOLT OR VALVE
VERT	VERTICAL
VFA	VOLATILE FATTY ACID
VLV	VALVE
VPC	VERTICAL POINT OF CURVATURE
VPT	VERTICAL POINT OF TANGENCY
VTR	VENT THROUGH ROOF
W	WATER OR WEST
W/	WITH
W/O	WITHOUT
WAS	WASTE ACTIVATED SLUDGE
WLC	WATER LEVEL CONTROL
WS	WATER SURFACE OR WATER STOP
WSO	WATER SERVICE OUTLET
WSP	WELDED STEEL PIPE
WV	WATER VALVE
WW	WASTEWATER
WWF	WELDED WIRE FABRIC
X	USED AS A VARIABLE
XING	CROSSING
YD	YARD
YPC	YELLOW PLASTIC CAP

ABBREVIATION NOTES:

1. CONTACT THE ENGINEER FOR ABBREVIATIONS NOT LISTED.
2. THIS IS A STANDARD ABBREVIATIONS SHEET. THEREFORE, SOME ABBREVIATIONS MAY APPEAR ON THIS SHEET AND MAY NOT BE UTILIZED ON THIS PROJECT.

GENERAL NOTES:

1. CONTRACTOR TO OBTAIN ALL REQUIRED PERMITS FOR CONSTRUCTION, DEWATERING AND STORMWATER DISCHARGES.
2. AS CONSTRUCTED ELEVATIONS SHALL BE WITHIN 0.1' OF ELEVATION SPECIFIED ON THE PLAN DRAWINGS.
3. CONTRACTOR SHALL PROTECT AND PRESERVE ALL EXISTING SITE FEATURES (INCLUDING VEGETATION, SURFACES, STRUCTURES, SURVEY MONUMENTATION, MAILBOXES, CULVERTS, SIGNAGE, DRAINAGE, ETC.) TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. ANY DAMAGE TO EXISTING SITE FEATURES SHALL BE REPAIRED TO ORIGINAL OR BETTER CONDITION AT NO ADDITIONAL COST TO THE OWNER.
4. "OR APPROVED EQUAL" IS IMPLIED WHENEVER A SPECIFIC PRODUCT IS REFERENCED.

NOTES FOR WATER & SEWER MAINS:

1. THE OWNER AND RESIDENTS SHALL BE NOTIFIED PRIOR TO CHANGE OR DISRUPTION OF WATER OR SEWER SYSTEM OPERATION.
2. WATER MAIN PIPING SHALL BE C900 PVC OR DUCTILE IRON.
3. SEWER MAIN PIPING SHALL BE DUCTILE IRON OR SDR-35 PVC SEWER PIPE.
4. ALL FORCEMAIN AND WATERMAIN FITTINGS, INCLUDING WYES, REDUCERS AND ELBOWS EQUAL TO OR GREATER THAN 22-1/2° SHALL BE RESTRAINED MECHANICAL JOINT. ALL MECHANICAL JOINT RESTRAINTS SHALL BE "MEGALUG", UNIFLANGE OR EQUAL. JOINT RESTRAINT SHALL BE IN ADDITION TO MEETING THRUST BLOCK REQUIREMENTS FOR ALL TEES AND 90° BENDS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
5. TRENCHES FOR THE INSTALLATION OF WATER MAINS & SEWER MAINS SHALL BE PROPERLY BACKFILLED AS QUICKLY AS POSSIBLE, BUT NO MORE THAN 48-HOURS AFTER INITIAL DIGGING. NON-SHRINK BACKFILL (FLOWABLE FILL) SHALL BE REQUIRED WHERE STANDARD COMPACTION EQUPMENT CANNOT BE USED.
6. WHEN WORKING NEAR AND/OR EXPOSING EXISTING UTILITIES AND SERVICE LINES, WORKERS SHALL UTILIZE HAND-DIGGING IN ORDER TO AVOID DAMAGE TO THOSE UTILITIES. IF DAMAGE OCCURS, THE COST OF REPAIR AND ANY PENALTIES WILL BE AT THE CONTRACTORS EXPENSE.
7. ALL EXISTING CONCRETE DIRECTLY AFFECTED BY CONSTRUCTION ACTIVITIES SHALL BE REPAIRED WITH FIBERMESH REINFORCED M4000 CONCRETE. SIDEWALKS DAMAGED BY CONTRACTOR'S EQUIPMENT SHALL BE REPLACED TO CONTRACT SPECIFICATIONS AT NO ADDITIONAL COST TO OWNER, AS NOTED ON THE PLAN SHEETS. ASPHALT DAMAGED BY CONTRACTOR'S EQUIPMENT OR CONSTRUCTION ACTIVITIES SHALL BE REPAIRED AS PER THE ASPHALT DETAIL IN THE CONTRACT DOCUMENTS.
8. A MINIMUM OF 18" OF VERTICAL AND 10' OF HORIZONTAL SEPARATION MUST BE MAINTAINED BETWEEN NEW WATERMAIN AND EXISTING SANITARY OR STORM SEWER COLLECTION PIPES. AT ALL CROSSINGS, ONE FULL LENGTH OF WATER PIPE MUST BE LOCATED SO BOTH JOINTS ARE AS FAR FROM THE EXISTING SANITARY OR STORM SEWER COLLECTION PIPES AS POSSIBLE.
9. RE-CONNECT ALL ACTIVE SERVICE LINES AT OR NEAR THE POINT OF CONNECTION TO THE EXISTING WATERMAIN/SEWERMAIN OR AT THE EXISTING CURB STOP. REPLACEMENT OF CURB STOPS IS NOT REQUIRED.

UTILITY NOTES:

1. BEFORE BEGINNING AN EXCAVATION, THE CONTRACTOR SHALL NOTIFY, THROUGH ONE-CALL NOTIFICATION CENTER, ALL OWNERS OF UNDERGROUND FACILITIES IN THE AREA OF THE PROPOSED EXCAVATION. THE PHONE NUMBER IS: **1-800-424-5555.** THE WEBSITE IS: www.callbeforeyoudig.org. UPON REQUEST, THE CONTRACTOR SHALL PROVIDE VERIFICATION THAT ONE-CALL HAS BEEN NOTIFIED.
2. AFTER AN OWNER OF AN UNDERGROUND FACILITY HAS LOCATED AND MARKED THE UNDERGROUND FACILITIES, THE CONTRACTOR SHALL DETERMINE IF WEATHER, TIME, OR OTHER FACTORS MAY HAVE AFFECTED LOCATION MARKS, WARRANTING RELOCATION OF THE FACILITIES.
3. IF EXCAVATION HAS NOT OCCURRED WITHIN 30 DAYS OF THE LOCATE AND MARK, THE CONTRACTOR SHALL REQUEST THAT THE FACILITY BE RELOCATED AND REMARKED BEFORE EXCAVATING UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE WITH THE UNDERGROUND UTILITY OWNER. THE CONTRACTOR IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH RELOCATING AND REMARKING A FACILITY THAT IS NOT EXCAVATED WITHIN 30 DAYS OF THE LOCATE AND MARK.
4. THE CONTRACTOR MAY NOT BEGIN EXCAVATING BEFORE THE LOCATING AND MARKING IS COMPLETE OR BEFORE THE CONTRACTOR IS NOTIFIED THAT LOCATING AND MARKING IS UNNECESSARY.
5. THE CONTRACTOR SHALL LOCATE AND MARK THE AREA TO BE EXCAVATED IF REQUESTED BY THE UNDERGROUND FACILITY OWNER OR THEIR REPRESENTATIVE. IF THE CONTRACTOR DISCOVERS AN UNDERGROUND FACILITY THAT HAS NOT BEEN LOCATED AND MARKED, THE CONTRACTOR SHALL STOP EXCAVATING IN THE VICINITY OF THE FACILITY AND NOTIFY THE FACILITY OWNER OR THE ONE-CALL NOTIFICATION CENTER. IF THIS OCCURS THE CONTRACTOR SHALL PROCEED WITH OTHER ELEMENTS OF THE PROJECT, AT NO COST TO THE PROJECT OWNER, UNTIL THE UNDERGROUND FACILITY OWNER HAS NOTIFIED THE CONTRACTOR THAT EXCAVATION CAN PROCEED.
6. PRIVATE UTILITIES ARE LOCATED ON THE SITE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO HIRE A PRIVATE LOCATOR TO LOCATE SAID UTILITIES. THE UTILITIES ARE SHOWN ON THE CONTRACT DRAWINGS TO THE BEST KNOWLEDGE OF THE ENGINEER & OWNER. IF SAID UTILITIES ARE DAMAGED DURING CONSTRUCTION, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO FIX THE DAMAGED UTILITIES AT NO ADDITIONAL COST TO THE OWNER.

EQUIPMENT NOTES:

1. SPECIFICALLY IDENTIFYING EQUIPMENT MANUFACTURERS DOES NOT DISQUALIFY OTHER "OR EQUAL" MANUFACTURERS FROM SUBMITTING.

MONTANA ADAM ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Abbreviations & Notes

Sheet
G-4

DESIGN INFLUENT WASTEWATER CHARACTERISTICS		
Design Year	2043	
Current Average Daily Flow	4,240	GPD
Design Average Daily Flow	5,513	GPD
Design Max Month	10,439	GPD
Design Peak Day	20,878	GPD
Average BOD Load	10.12	lb/day
Average TSS Load	33.10	lb/day
Average TP Load	0.37	lb/day
Average TN Load	1.84	lb/day

REGULATORY EFFLUENT STANDARDS		
BOD_5	30	mg/L
Total Suspended Solids	30	mg/L
E. Coli	32	og/100 mL
Effluent Total Phosphorous	0.12	mg/L
Effluent Total Nitrogen	9.18	mg/L
Daily Max Effluent Chlorine	0.019	mg/L

* Total Phosphorus Load Limit - 2 lb/yr at Design ADF
Total Nitrogen Load Limit - 154 lb/yr at Design ADF

SUMMARY OF PROJECT IMPROVEMENTS
(Not all-inclusive)

Lift Station Building
- New Influent Pumps
- New Effluent Pumps
- New Controls
- Rehabilitate Building Interior

Package Membrane Bioreactor Treatment Facility
- Primary Settling Tank
- Equalization Tank
- Sludge Storage Tank
- Screening
- 2 Membrane Cassettes
- Aeration Blowers
- Chemical Addition
- Flow Meters
- Control System

Asphalt Access Road and Parking Area

Access Sidewalk to the Package Plant

Site Landscaping

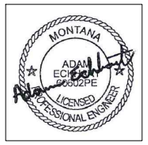
Forcemain Extension to the Package Plant Equipment

Potable Water Extension to the Package Plant

Effluent Sanitary Sewer Extension to the Lift Station

Re-Route Gravel Access to Zoology

Emergency Generator



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Draft	8-7-23	AE
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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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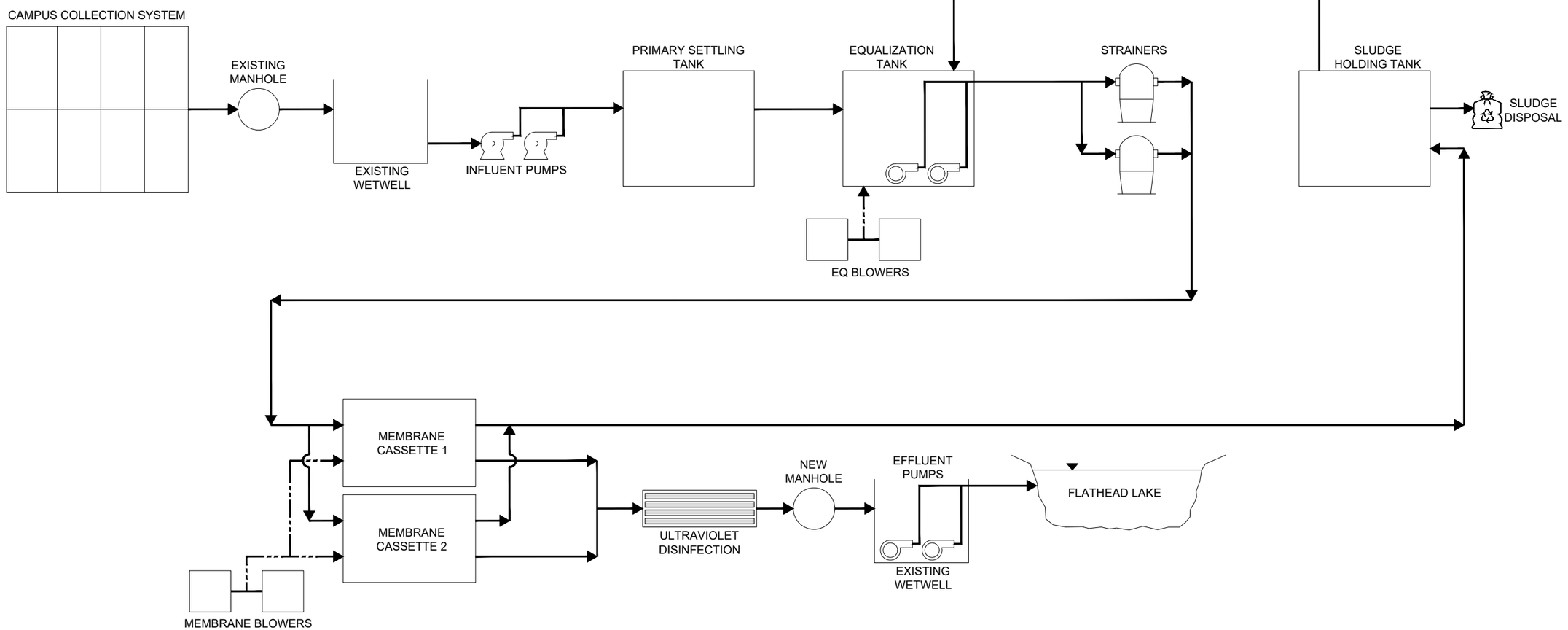
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Design Criteria

Sheet
G-5



Process Flow Diagram

NO SCALE

Revision	Date	By
Draft	8-7-23	AE
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Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
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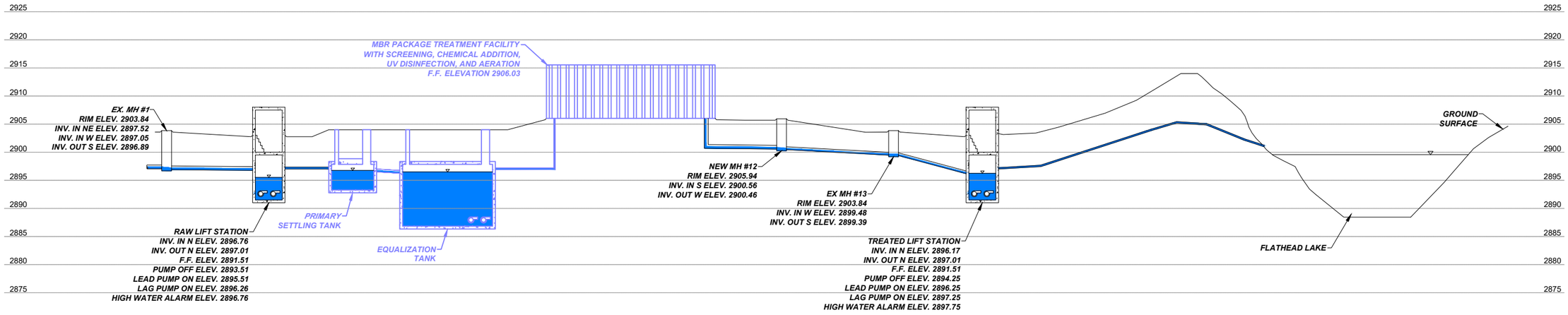
Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Process Flow Diagram**

Sheet: **G-6**



Hydraulic Profile

X:\FLATHEAD LAKE BIOLOGICAL STATION – WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\General\G-7.dwg SAVED:9/25/23 PRINTED:2/7/24 BY:ADAM

MONTANA
ADAM ECKHART 20022PE
LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Owner: Flathead Lake Biological Station

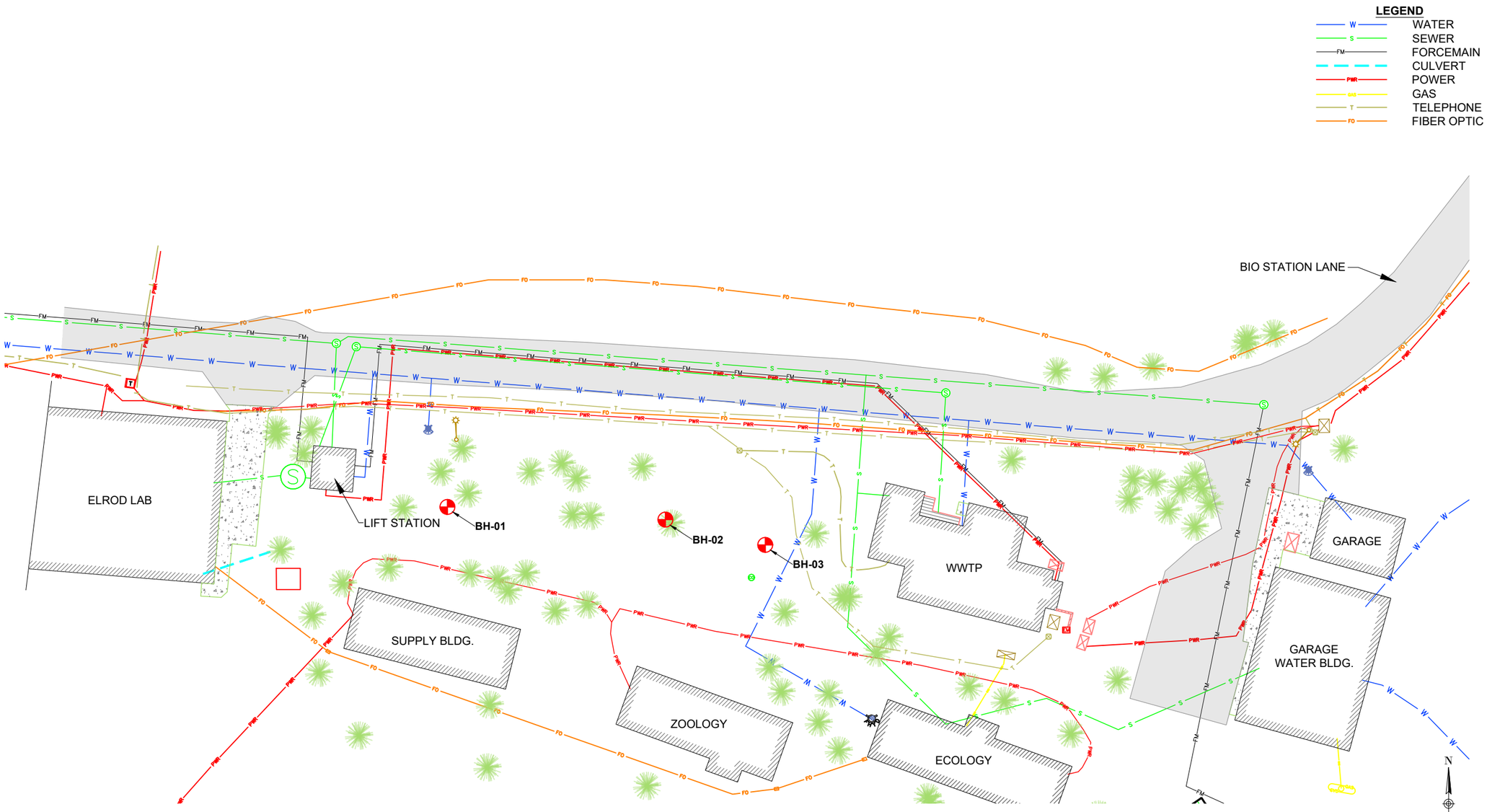
Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Hydraulic Profile**

Sheet: **G-7**

NOTES:

- **GEOTECHNICAL REPORT INCLUDED IN APPENDIX C OF THE CONTRACT DOCUMENTS.**



Borehole Locations

Revision	Date	By
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Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title: **Geotechnical Borehole Locations**

Sheet: **G-8**

NOTES:

- PRELIMINARY P&ID DRAWINGS BASED ON STREAMGO & INCLUDED FOR REFERENCE ONLY. FINAL P&ID DRAWINGS SHALL BE APPROVED BY THE ENGINEER DURING THE SUBMITTAL PHASE. FINAL P&ID DRAWINGS SHALL BE SUPPLIED TO ENGINEER IN CAD (.DWG) FORMAT TO INCLUDE WITH AS-BUILT DRAWINGS.
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LEGEND – PIPE

Forcemain
Air
Tubing–1
Tubing–2
Tubing–3
Gravity
Chemical
Conduit

VALVES

BLV–XXXX	BALL VALVE
BFV–XXXX	BUTTERFLY VALVE
BCV–XXXX	BALL CHECK VALVE
SPCV–XXXX	SPRING CHECK VALVE
WCV–XXXX	WYE CHECK VALVE
BFCV–XXXX	BUTTERFLY CHECK VALVE
GLV–XXXX	GLOBE VALVE
GTV–XXXX	GATE VALVE
SV–XXXX	SOLENOID VALVE
ABLV–XXXX	P/E PNEUMATIC/ELECTRIC ACTUATED BALL VALVE
ABFV–XXXX	P/E PNEUMATIC/ELECTRIC ACTUATED BUTTERFLY VALVE
ABLV–XXXX	P/E PNEUMATIC/ELECTRIC ACTUATED 3 WAY VALVE
ARV–XXXX	AIR RELEASE VALVE
PRV–XXXX	PRESSURE REGULATOR VALVE
CARV–XXXX	COMBINATION VALVE
PS–XXXX	PRESSURE SWITCH
PGV–XXXX / APGV–XXXX	PLUG/ACTUATED PLUG VALVE
FTV–XXXX	FOOT VALVE

INSTRUMENTS

PI 1001 @XXPSI	PRESSURE INDICATOR
PT 1001 @XXPSI	PRESSURE TRANSDUCER
PHT 1001	pH TRANSMITTER
LT 1001	LEVEL TRANSMITTER
DO 1001	DISSOLVED OXYGEN PROBE
TSS 1001	TOTAL SUSPENDED SOLIDS PROBE
LSXX–XXXX	LEVEL SWITCH
FM–XXXX	FLOW METER
AFM–XXXX	AIR FLOW METER
SP	SAMPLE PORT
PP	PRIMING PORT
DP	DRAIN PORT
FR–XXXX	FLOW RESTRICTOR
BPV	BACK PRESSURE VALVE
CLF CLM	CAMLOK FEMALE/MALE END
HOSE BIBB CONNECTION 2"x1"	REDUCER

EQUIPMENT AND SPECIAL

EFFLUENT FILTERS	
Gooseneck Vent	
NOTES	
END CAP	
FLOW ARROW	
BLOWER B–XXXX	
MOTOR M–XXXX	
STRAINER STR–XXXX	
MIXER MX–XXXX	
CHEMICAL TOTE CT–XXXX	
CARTRIDGE FILTER FLT XX/XX	
POLY TANK T–XXXX	
ULTRAVIOLET LIGHT UV–XXXX	
EYE WASH STATION	
STRAINER STR–XXXX	
BACK FLOW PREVENTER BFP–XXXX	
DOLPHIN STR–xxxx	DOLPHIN STRAINER
EXJ–XXXX	EXPANSION JOINT
VB–XXXX	VACUUM BREAKER
FF–XXXX	FERNCO FASTENER
EJ–XXXX	AIR EJECTOR
TSSM	
BIDIRECTIONAL FLOW	
P–XXXX	POSITIVE DIPLACEMENT PUMP
P–XXXX	CENTRIFUGAL PUMP
P–XXXX	SUBMERSIBLE PUMP
CP–XXXX	CHEMICAL PUMP
MEMBRANE CASSETTE MBR–XXXX	
MEMBRANE TANK MT–XXXX	
FBD–XXXX CBD–XXXX	FINE BUBBLE COARSE BUBBLE DIFFUSERS
LASER	
ACCUMULATOR ACC–XXXX	
CALIBRATION COLUMN	

MONTANA ADAM ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
PID Symbols and Legend

Sheet
PID-1

NOTES:

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2.5" RAS HDPE-DR17
From MBR BUILDING
(P&ID-5-C06a)

To BIOLOGICAL BUILDING
2.5" RAS HDPE DR17
(P&ID-6-C06b)

3" SS
From MBR BUILDING
(P&ID-3-C09)

3" CPVC SBO
To BIOLOGICAL BUILDING
(P&ID-6-C09)

STRAINER FEED
MBR BUILDING → BIOLOGICAL BUILDING

3" RAS
MBR BUILDING → BIOLOGICAL BUILDING

3" RAS
MBR BUILDING → BIOLOGICAL BUILDING

3" MBR FEED
BIOLOGICAL BUILDING → MBR BUILDING

3" MBR FEED
BIOLOGICAL BUILDING → MBR BUILDING

CURB STOP 2" BLV-3018 → 2" HDPE DR17 POTABLE WATER (P&ID-4-C18)

CURB STOP 2" BLV-4040 → 2" HDPE DR17 POTABLE WATER (P&ID-7-C19)

CURB STOP 2" BLV → POTABLE WATER (P&ID-5-PW1)

CURB STOP 2" BLV → POTABLE WATER (P&ID-5-PW2)

2" HDPE DR17
To MBR BUILDING
P&ID-7-C01

S80 CPVC SS

NOTE 1.

AIR 1-1/4" SS/S80 CPVC
From MBR BUILDING
P&ID-3-C21

1.5" CONDUIT WITH 3/8" TUBING FOR COMPRESSED AIR LINE (P&ID-5-C12)

6" SDR35 (1% Slope)
From MBR BUILDING WAS
P&ID-5-C03

1"
ARV-1301

3"
BLV-1301

3"
BLV-1302

LSHH-1301
LSH-1301
LSHL-1301
LSL-1301
LSLL-1301

1"
BCV-1301

1"
BCV-1302

P-1301
P-1302

LIFT STATION

3" HDPE DR17

1.5" CONDUIT
From MBR BUILDING
With QTY (1) 1/4" OD TUBE
INSIDE(Alum)
P&ID-3-C15a

1.5" CONDUIT
From MBR BUILDING
With QTY (1) 1/4" OD TUBE
INSIDE(Alum)
P&ID-3-C15b

6" Gooseneck
VENT GALV

LSHH-1001

(4) Septic Filter 1/8"

PRIMARY SETTLING TANK
(PST-1001)
25,000 L

6" SDR35
(1% Slope)

6" Gooseneck
VENT GALV

HDPE
DR17

S80
PVC

LSHH-1101
LSH-1101
LSL-1101
LSLL-1101

LT
1101

Coarse Bubble Diffusers QTY 6

2" S80 PVC
Forcemain

1"
BLV-1101

1"
BLV-1102

1"
WCV-1101

1"
WCV-1102

P-1101
P-1102

EQUALIZATION TANK
(ET-1101)
28500 L

2" HDPE DR 17

6" Gooseneck
VENT GALV

LSHH-1201
LSH-1201
LSLL-1201

2"
BLV-XXXX

2" 2" SCH80 PVC

2"
BCV-XXXX

DECANT PUMP

SLUDGE TANK
(ST-1201)
28500 L

NOTE:
1. UNDERGROUND BLOWER LINES ARE STAINLESS STEEL, APPROXIMATELY 20 FT IN LENGTH THEN TRANSITION TO CPVC.

Revision	Date	By
Draft	8-7-23	AE
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Revision: Final
Plot Scale: 1:2
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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Underground Civil Works Flow Diagram

Sheet
PID-2

NOTES:

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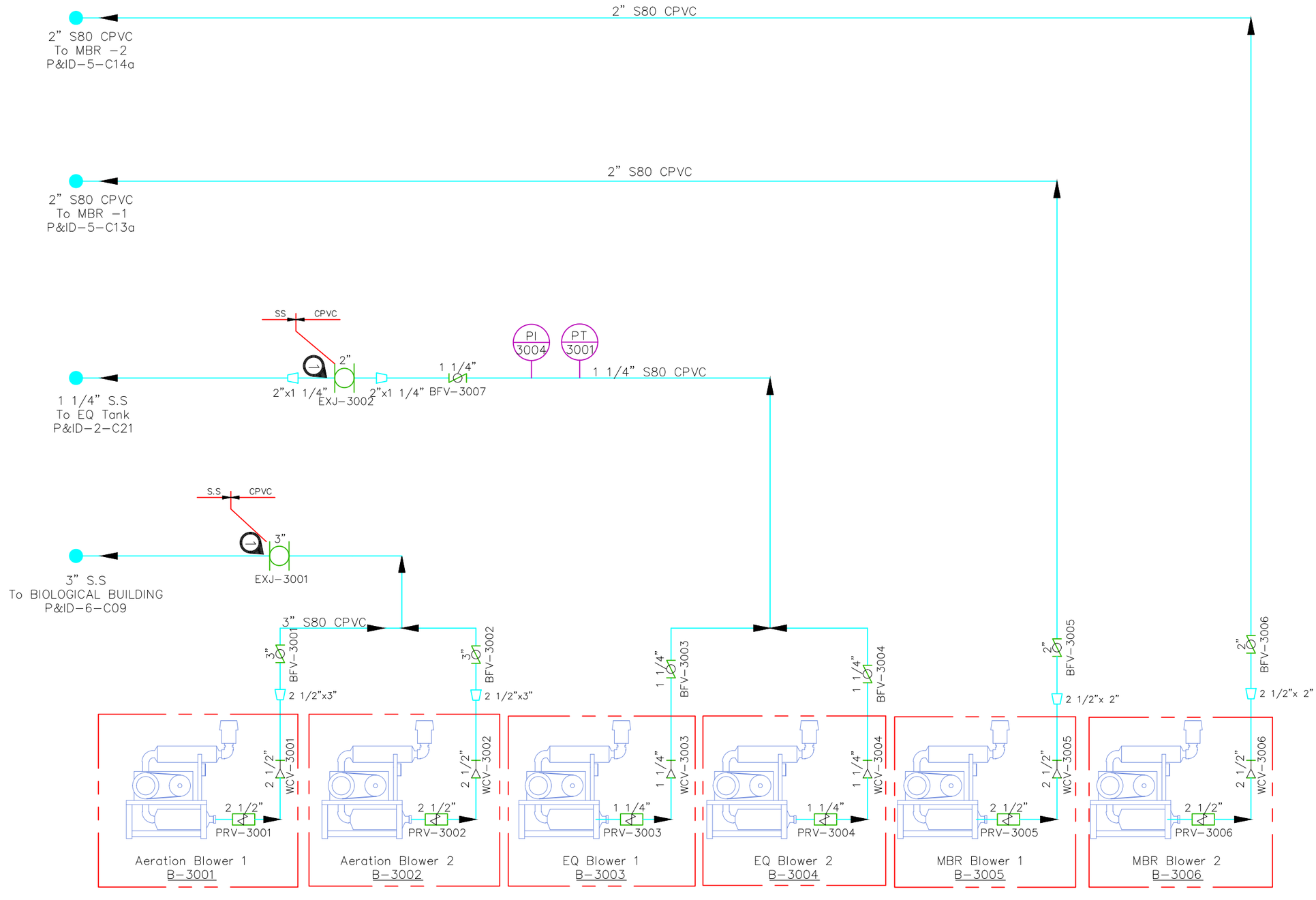

NOTE:
1. UNDERGROUND BLOWER LINES ARE STAINLESS STEEL, APPROXIMATELY 20 FT IN LENGTH THEN TRANSITION TO CPVC.

MONTANA
ADAM ECKHART 20022PE
LICENSED PROFESSIONAL ENGINEER

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Blower Flow Diagram

Sheet
PID-3

NOTES:

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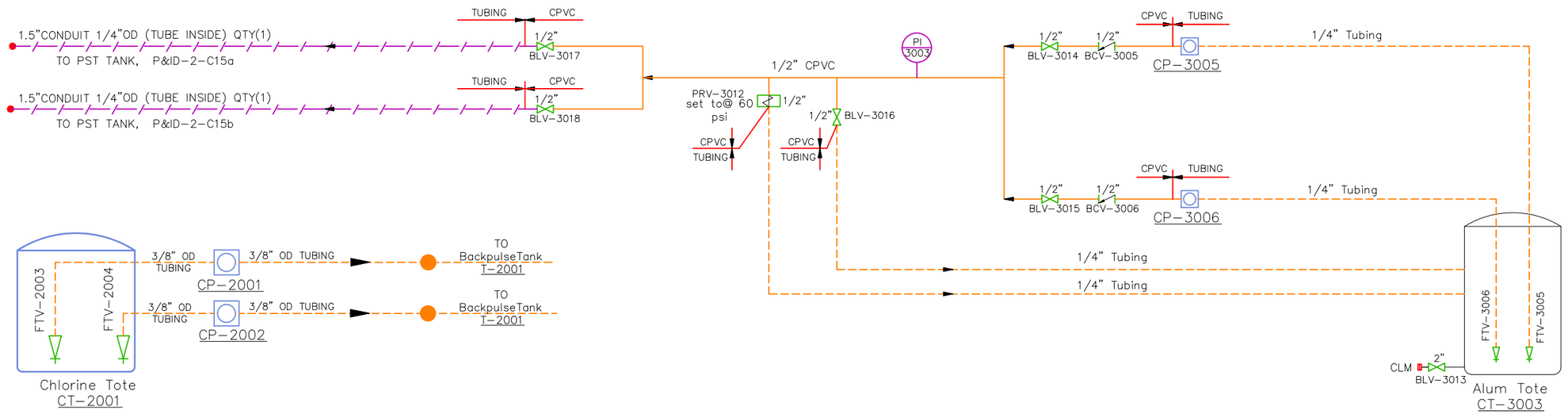

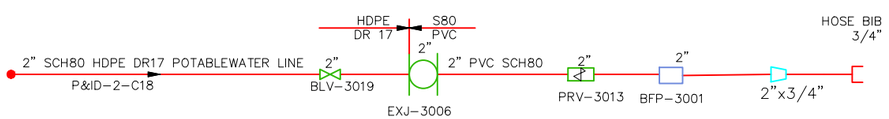

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Owner

Flathead Lake Biological Station

Project Title

Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title

Chemical Flow Diagram

Sheet

PID-4

NOTES:

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NOTE:
1. CLAMP REQUIRED ON FLOW METER.
2. 3/4" HOSE BIBB CONNECTION
3. AS CLOSE TO THE BALL VALVE BLV-2013 AND BLV-2021 OF PERMEATE LINE AS POSSIBLE
4. AS LOW ON BACKPULSE TANK AS POSSIBLE.
5. THIS IS TO AVOID WATER HAMMER.
6. VENT ON THE HIGHEST POINT OF LINES.

1.5" CONDUIT to SLUDGE TANK (AIR LIFT PUMP) With QTY (1) 1/4" OD TUBE INSIDE P&ID-2,C12
1.5" CONDUIT to BIOLOGICAL BUILDING With QTY (1) 3/8" OD TUBE INSIDE P&ID-6,C10a
1.5" CONDUIT to BIOLOGICAL BUILDING With QTY (1) 3/8" OD TUBE INSIDE P&ID-6,C11a
1/2" OD Tubing To All Actuated Valves
TO AIR LIFT PUMP SLUDGE TANK
A1 – DO PROBE–1 4001
A1 – DO PROBE–2 4002
PRV-2005 SV-2003 PS-2003 Air Compressor AC–2003
SV-2003 PRV-2001 PT 2006 @100PSI SV-2001 PS-2001 Air Compressor AC–2001
SV-2004 PRV-2002 SV-2002 PS-2002 Air Compressor AC–2002
PRV-2004

3" HDPE DR17 RAS To BIOLOGICAL BUILDING (AEROBIC–1 TankT–4003) P&ID–6–C06a
EXJ–2004 BLV–2058 BCV–2007 BLV–2057 RAS. Pump– 1 P–2007
3" HDPE DR17 RAS To BIOLOGICAL BUILDING (AEROBIC–1 TankT–4003) P&ID–6–C06b
EXJ–2001 BLV–2060 BCV–2008 BLV–2059 RAS. Pump–2 P–2008
3" HDPE DR17 From POST ANOXIC TANK (P&ID–6–C04a) BIOLOGICAL BUILDING
EXJ–2002 BLV–2001
3" HDPE DR17 From POST ANOXIC Tank (P&ID–6–C05a) BIOLOGICAL BUILDING
EXJ–2003 BLV–2017
2" S80 CPVC (AIR) (P&ID–3–C13b)
2" S80 CPVC(AIR) (P&ID–3–C14b)

Permeate Pump 2 P–2006
Permeate Pump 1 P–2005
BCV–2001 BLV–2012 FM–2003 BLV–2055
BLV–2021 BLV–2052 DRAIN
BLV–2056
BCV–2002 BLV–2015 FM–2007 BLV–2014
BLV–2013 BLV–2054 DRAIN
BLV–2053 SV–2008 BCV–2003 SV–2007 BCV–2005
FROM CP–2001
FROM CP–2002
1.5" S80 PVC
1" S80 PVC
BLV–2022 ABLV–2003 ABLV–2004 ABLV–2006 ABLV–2005 BLV–2023 BLV–2024 BLV–2005
PI 2003 PT 2003 @XXPSI PT 2004 @XXPSI PI 2004
BLV–2027 BLV–2026 BLV–2025
SV–2005 BCV–2030 BLV–2045 ABLV–2007
1 1/4" S80 PVC
BCV–2004 BLV–2042 P–2004
BLV–2043 BCV–2006 P–2003
FM–2006
BLV–2041 BLV–2044
LSHH–1005 LSLL–1005 Backpulse Tank T–2001
LT 2003
BLV–2040
SV–2006 3/4"x 1" GLV–2001 Ejector EJ–2001 BLV–2049
BLV–2046 BLV–2048 BLV–2047 3/4" CLM
BFP–1001
EXJ–2005
2" S80 PVC From Potable Water Line (C18)
CARV–2003
Potable Water Foam Control Nozzles (P&ID–2–PW2)
Membrane Cassette 1 MBR–2001
Membrane Cassette 2 MBR–2002
LT 2001 LT 2002
12" S40 PVC
BLV–2004 BLV–2009 BLV–2005 BLV–2010
FM–2004 FM–2005
Recirc. Pump P–2001 Recirc. Pump P–2002
BLV–2050 DRAIN BLV–2051 DRAIN
BLV–2008 BLV–2011 ABLV–2002
ARV–2001 ARV–2002
FM–2001 BLV–2002 BLV–2006
BLV–2037 ABLV–2011 BLV–2038 ABLV–2012
Scum Collection Box
Potable Water (P&ID–2–PW1)
BLV–2061 BLV–2062 AFM–2001 AFM–2002 FM–2002
2 1/4" S80 PVC
BLV–2017 BFV–2001 BFV–2002
2" S80 PVC WAS
6" x 2"
BLV–2036
PI 2001 PT 2001 PI 2002 PT 2002
FROM STRAINER WAS LINE (P&ID–7)
6" S80 PVC WAS
4" x1" 1" S80 PVC
1.5" S80 PVC
1.5" x 1 1/4" S80 PVC
BLV–2030 BLV–2031 BLV–2033 BLV–2034
BCV–2009 BCV–2010
UV 1 UV–2001 UV 2 UV–2002
FR–2001 FR–2002
BLV–2029 BLV–2028
HDPE DR17 S80 PVC EXJ–2008 EXJ–2009 EXJ–2010
BLV–2064 BLV–2065 BLV–2066 ABLV–2008 ABLV–2009 ABLV–2010
DISPERSAL BED–1 C30 DISPERSAL BED–2 C31 DISPERSAL BED–3 C32
BLV–2063 2" CLM
S80 PVC SDR 35 FERNCO 6"X6" FF–2001
6" SDR 35 To Sludge Tank WAS P&ID–2–C03

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Owner
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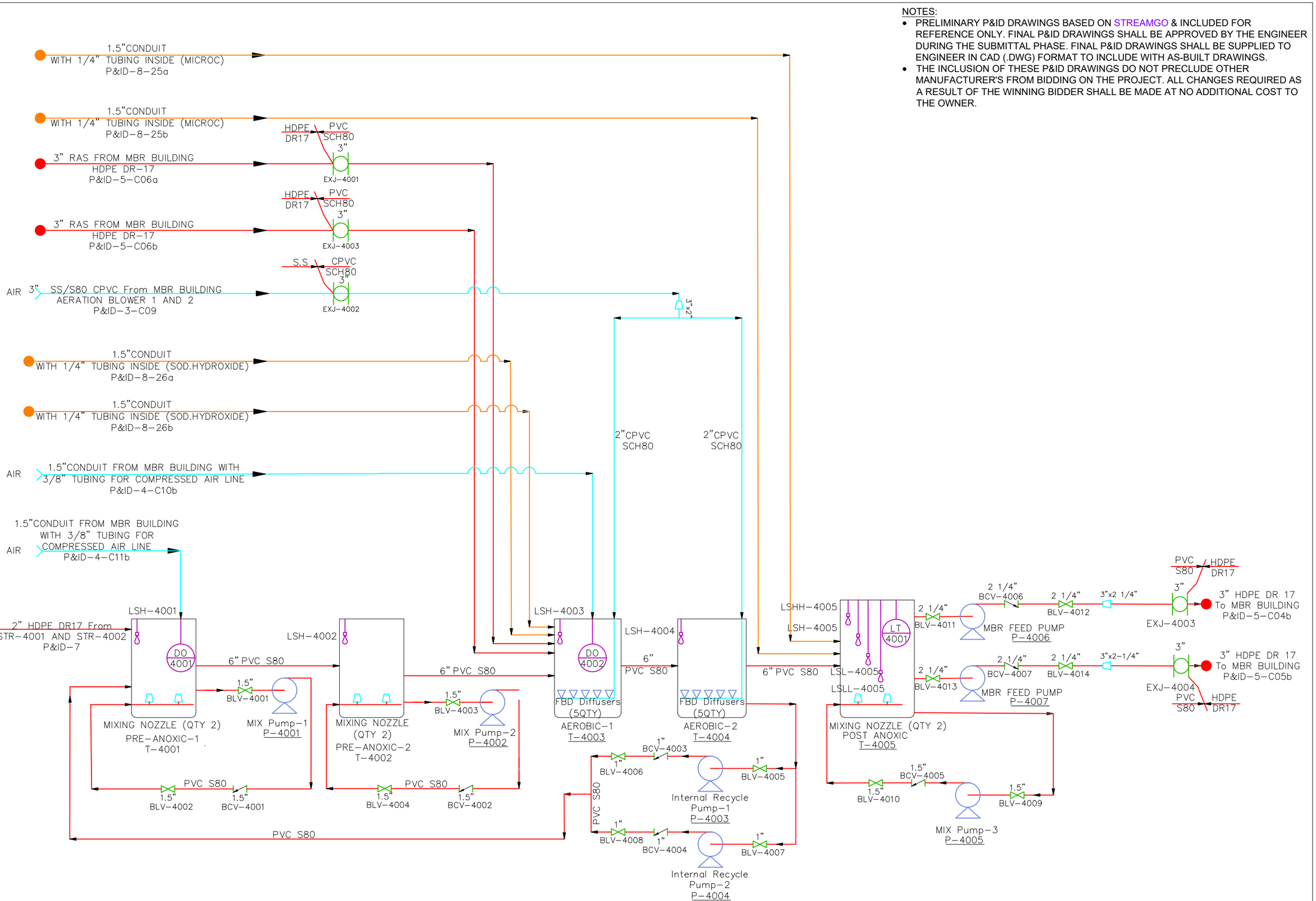
Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
MBR Building Flow Diagram

Sheet
PID-5



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Owner

Flathead Lake Biological Station

Project Title

Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title

Biological Building Flow Diagram Part 1

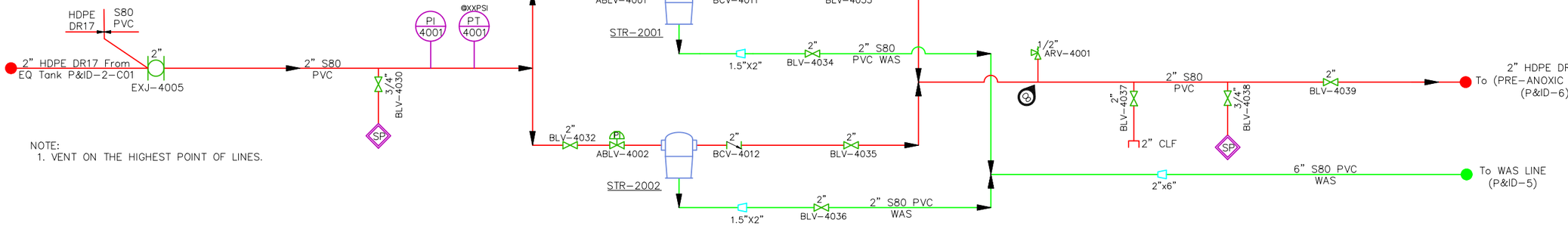
Sheet

PID-6

X:\FLATHEAD LAKE BIOLOGICAL STATION - WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\P&ID\P&ID-6.dwg SAVED:2/5/24 PRINTED:2/7/24 BY:ADAM

NOTES:

- PRELIMINARY P&ID DRAWINGS BASED ON STREAMGO & INCLUDED FOR REFERENCE ONLY. FINAL P&ID DRAWINGS SHALL BE APPROVED BY THE ENGINEER DURING THE SUBMITTAL PHASE. FINAL P&ID DRAWINGS SHALL BE SUPPLIED TO ENGINEER IN CAD (.DWG) FORMAT TO INCLUDE WITH AS-BUILT DRAWINGS.
- THE INCLUSION OF THESE P&ID DRAWINGS DO NOT PRECLUDE OTHER MANUFACTURER'S FROM BIDDING ON THE PROJECT. ALL CHANGES REQUIRED AS A RESULT OF THE WINNING BIDDER SHALL BE MADE AT NO ADDITIONAL COST TO THE OWNER.



NOTE:
1. VENT ON THE HIGHEST POINT OF LINES.

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MONTANA ADAM ECKHART COOPE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner

Flathead Lake Biological Station

Project Title

Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title

Screening Flow Diagram

Sheet

PID-7

NOTES:

- PRELIMINARY P&ID DRAWINGS BASED ON STREAMGO & INCLUDED FOR REFERENCE ONLY. FINAL P&ID DRAWINGS SHALL BE APPROVED BY THE ENGINEER DURING THE SUBMITTAL PHASE. FINAL P&ID DRAWINGS SHALL BE SUPPLIED TO ENGINEER IN CAD (.DWG) FORMAT TO INCLUDE WITH AS-BUILT DRAWINGS.
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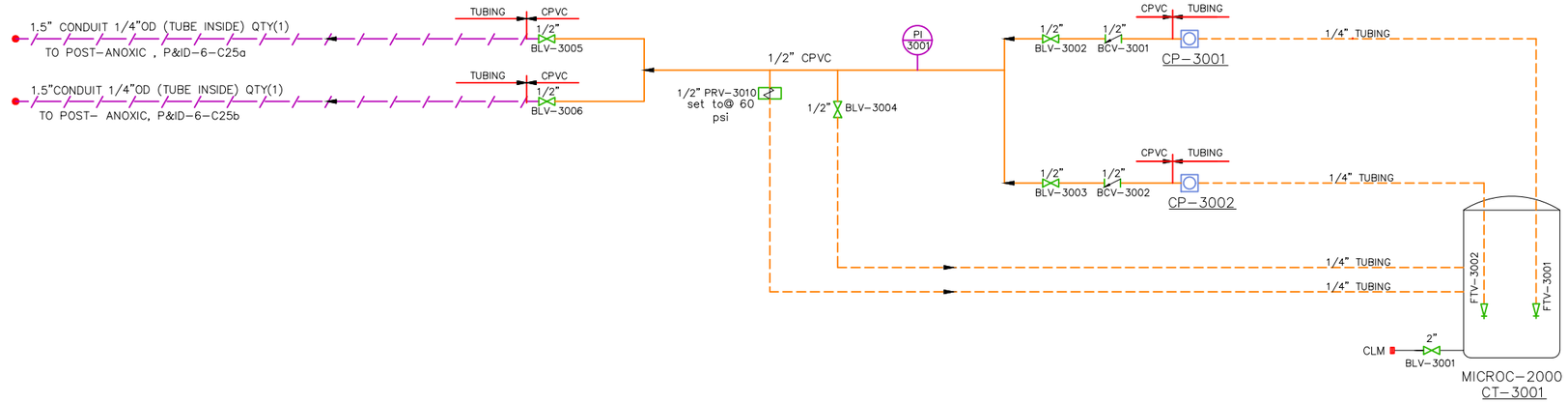

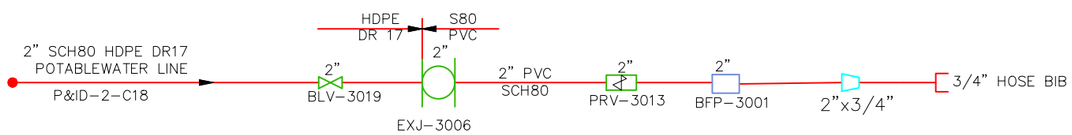

MONTANA
ADAM EDWARD COUPE
LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
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Owner

Flathead Lake Biological Station

Project Title

Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title

Biological Building Flow Diagram Part 2

Sheet

PID-8

FLATHEAD LAKE BIOLOGICAL STATION

**LOCATED IN THE NORTHEAST ONE-QUARTER (1/4) OF SECTION 4,
TOWNSHIP 24 NORTH, RANGE 19 WEST,
PRINCIPAL MERIDIAN MONTANA;
LAKE COUNTY, MONTANA**

N

SCALE 20 10 0 20 40
Feet

SURVEY CONTROL
MODIFIED MONTANA STATE PLANE COORDINATES (FEET)
SCALED TO GROUND AT POINT #50
BY SCALE FACTOR OF 1.00063

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
50	1354395.8500	857406.8860	2905.1730	SET RPC
51	1354390.0090	857280.2790	2903.5030	SET MAG NAIL
52	1354358.2550	857667.2730	2910.5150	SET MAG NAIL
23	1354236.3750	857627.6040	2905.6170	SET MAG NAIL

BASIS OF BEARINGS
GRID NORTH OF MONTANA STATE
PLANE COORDINATE SYSTEM
(FIPS 2500)
NAD83 (2011) (EPOCH 2010.00)
(GROUND DISTANCES SHOWN)

VERTICAL DATUM
NVD 1988
BY OPUS SOLUTION AT POINT 50

SURVEY TIMELINE
INITIAL SURVEY DATE: 3/7/22
PLAT DRAWN: 3/21/22

1/4	SEC	T	R
X	4	24N	19W
PRINCIPAL MERIDIAN OF MONTANA			
FLATHEAD LAKE			
LAKE COUNTY, MONTANA			

SURVEYOR'S NOTES:
THIS MAP IS A COMPOSITE OF TERRESTRIAL, GNSS, LIDAR, AND PHOTOGRAMMETRY DATA COLLECTED DURING ONE SITE VISIT ON MARCH 7, 2022. MOST TREES WERE LOCATED USING A TOTAL STATION *DIRECT FEFLEX* LASER; POINT ELEVATION DATA FOR TREES MAY NOT BE REPRESENTATIVE OF GROUND ELEVATIONS. GROUND SURFACE TOPOGRAPHY WAS GENERATED BY CONTOURING A 5-FOOT GRID OF 1-SIGMA STANDARD DEVIATION POINTS GATHERED BY A UAS-MOUNTED *YELLOWSCAN MAPPER* LIDAR HEAD. GROUND TRUTHING POINTS COLLECTED INDEPENDENTLY ESTABLISH THAT GRIDDED LIDAR SURFACE DATA IS ACCURATE TO WITHIN 0.15 FOOT.

MONTANA
ADAM EDWARD ECKHART
PROFESSIONAL ENGINEER
LICENSED

Revision	Date	By
Draft	8-7-23	AE
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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
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Owner: Flathead Lake Biological Station

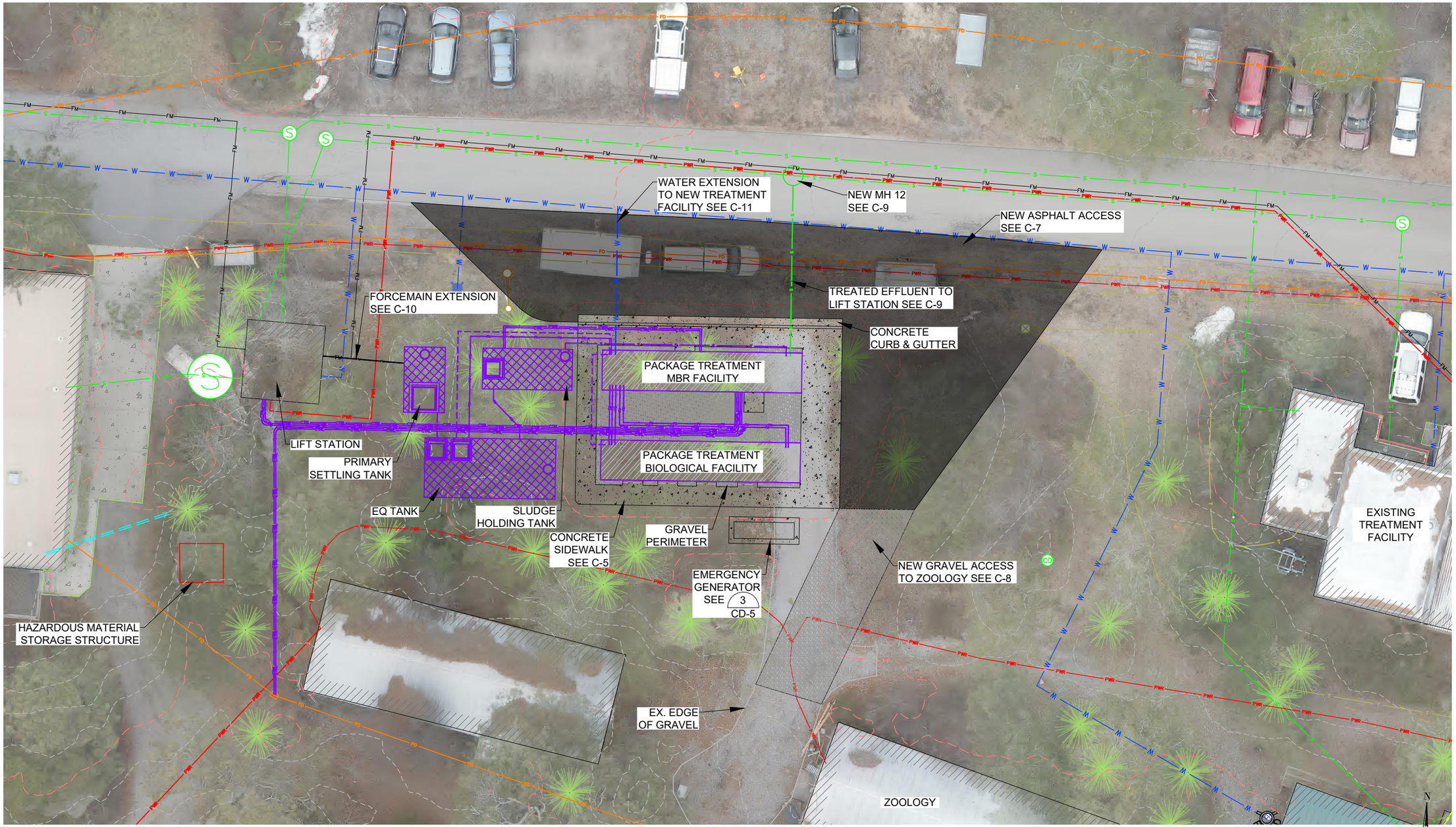
Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Location and Survey Control Coordinates**

Sheet: **C-1**

NOTES:

- PACKAGE TREATMENT FACILITY: THE PACKAGE TREATMENT DIMENSIONS, TANK SIZES, PIPE SIZES, PIPE LOCATIONS ETC. ARE BASED ON ONE PACKAGE TREATMENT FACILITY MANUFACTURER OR SUPPLIED EQUIPMENT (STREAMGO). DIMENSIONS/SIZES/LOCATIONS MAY CHANGE SUPPLIED EQUIPMENT AND MAY CHANGE IF STREAMGO EQUIPMENT IS DIFFERENT THAN ANTICIPATED. FINAL DIMENSIONS/SIZES/LOCATIONS ARE TO BE DETERMINED AS PART OF THE EQUIPMENT SUBMITTAL PROCESS. CONSTRUCTION ACTIVITIES RELATED TO THE PACKAGE TREATMENT FACILITY SHALL NOT BEGIN UNTIL SUBMITTALS ARE APPROVED. BID PRICES MUST BE BASED ON EQUIPMENT THAT IS BEING PROPOSED BY BIDDER SUBJECT TO OWNER AND ENGINEER APPROVAL. CHANGES IN EQUIPMENT DIMENSIONS/SIZES/LOCATIONS MUST BE MADE AT NO COST TO OWNER.
- SEE SHEET C-13 FOR MORE INFORMATION REGARDING THE EQUIPMENT DIMENSIONS, PIPE SIZES, LOCATION, ETC.



Site Plan

SCALE 10 5 0 10 20 Feet

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MONTANA ADAM ECKHART 20032PE LICENSED PROFESSIONAL ENGINEER

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Checked By: P.Montgomery, P.E.
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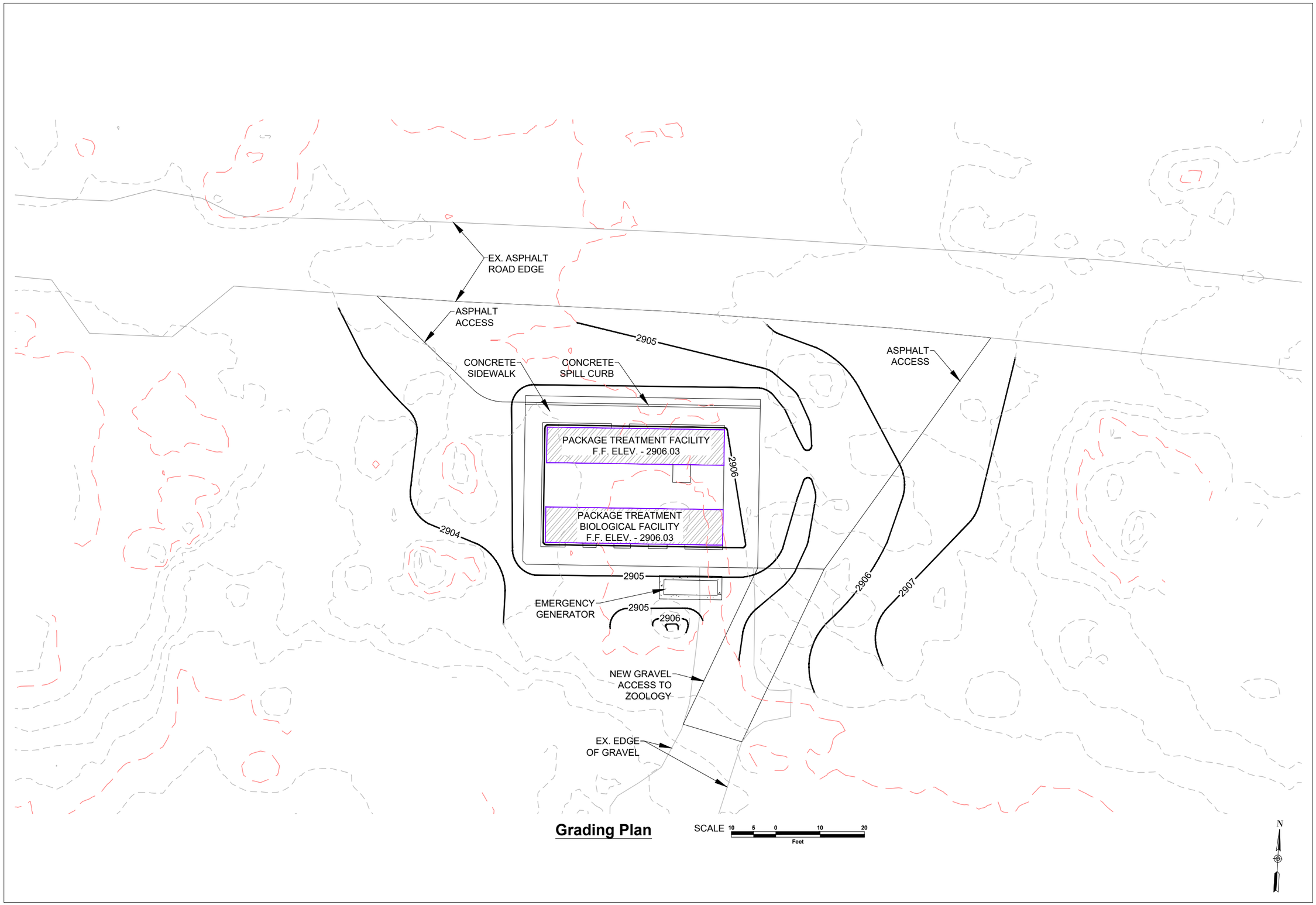
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Site Plan

Sheet
C-2



Grading Plan

SCALE 10 5 0 10 20
Feet

MONTANA
ADAM ECKHART
20032PE
LICENSED
PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Designed By: A.Eckhart, P.E.

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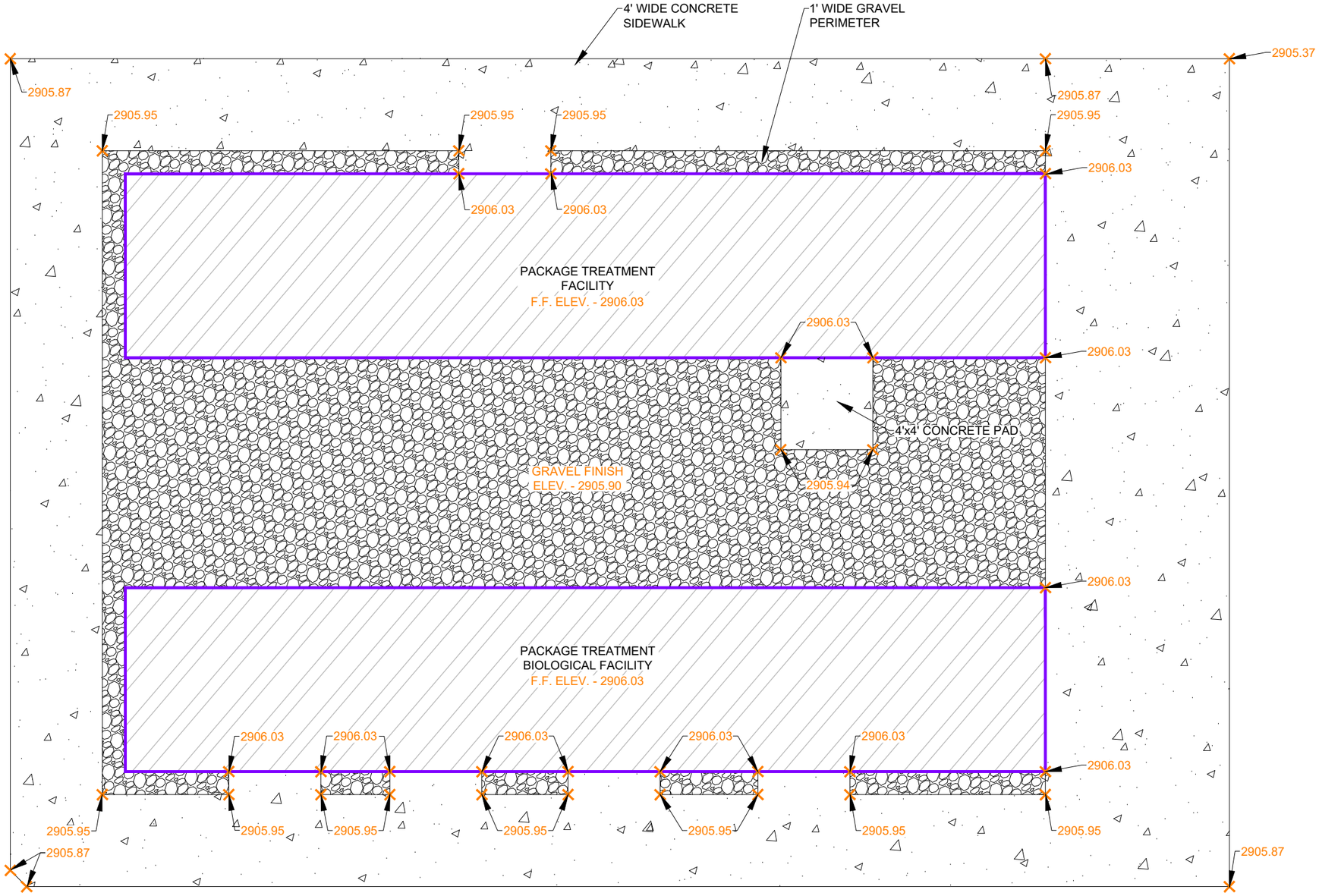
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Grading Plan

Sheet
C-3



Facility Elevation Point Plan

SCALE 2.5 1.25 0 2.5 5
Feet

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Plot Scale: 1:2
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Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
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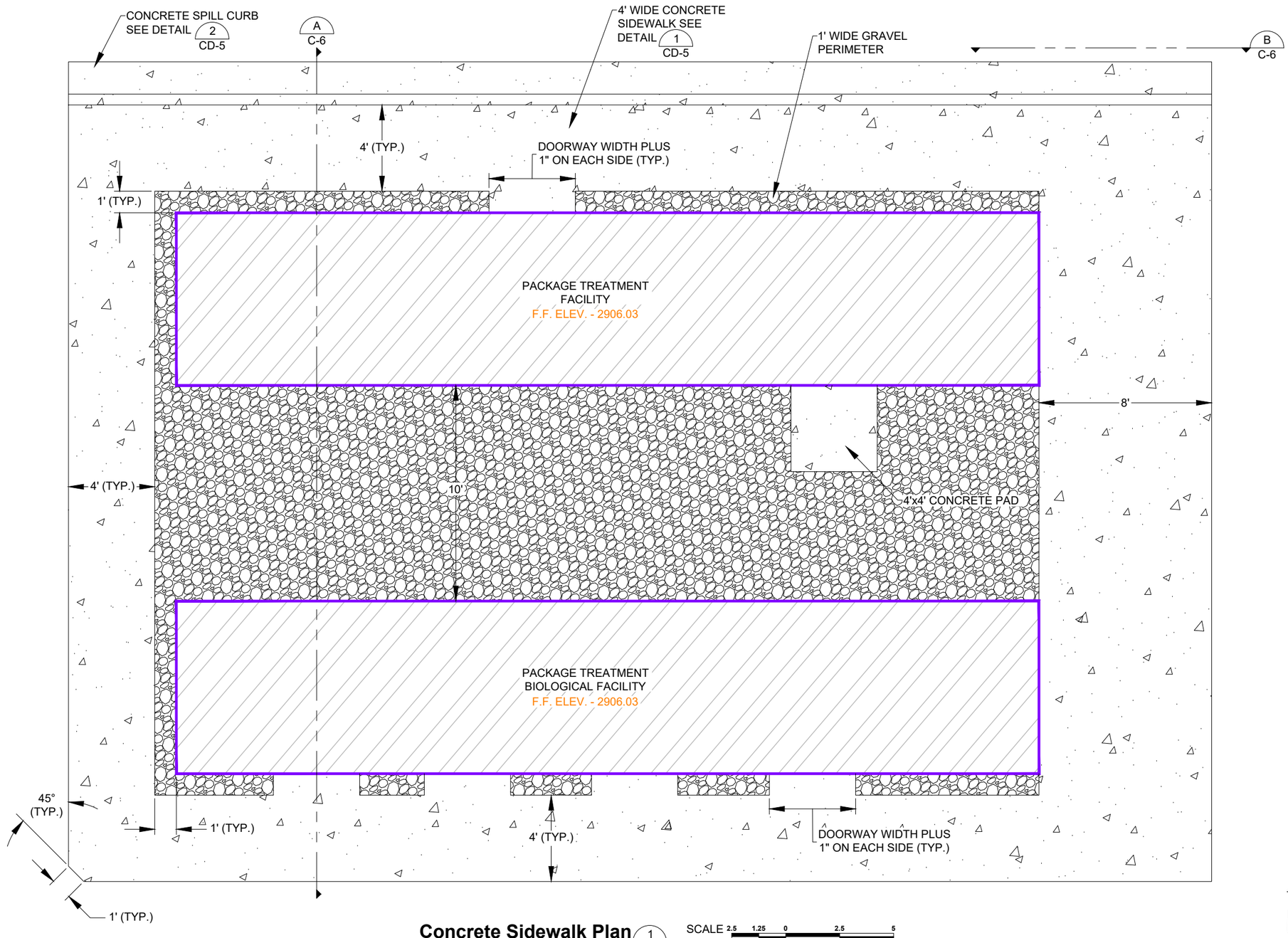
Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Facility Elevation Point Plan**

Sheet: **C-4**



Concrete Sidewalk Plan 1

SCALE 2.5 1.25 0 2.5 5 Feet

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner
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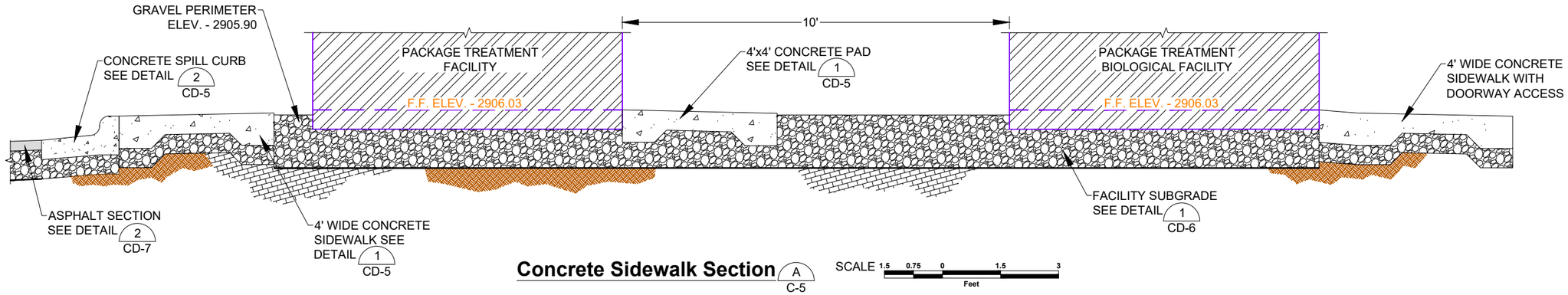
Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

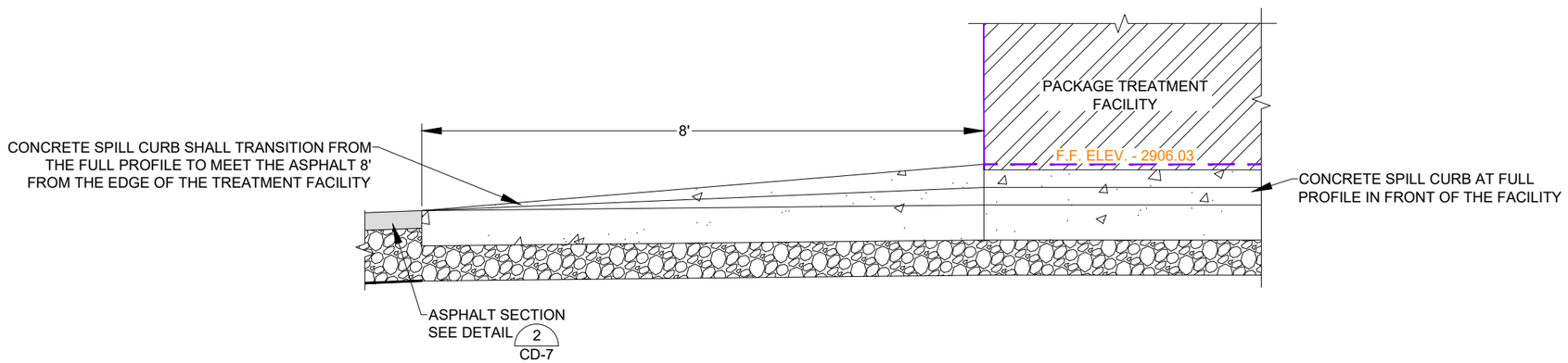
Sheet Title
Facility Concrete Sidewalk Plan

Sheet
C-5



Concrete Sidewalk Section A C-5

SCALE 1.5 0.75 0 1.5 3 Feet



Concrete Sidewalk Section B C-5

SCALE 1 0.5 0 1 2 Feet

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MONTANA ADAM ECKHART 30029E LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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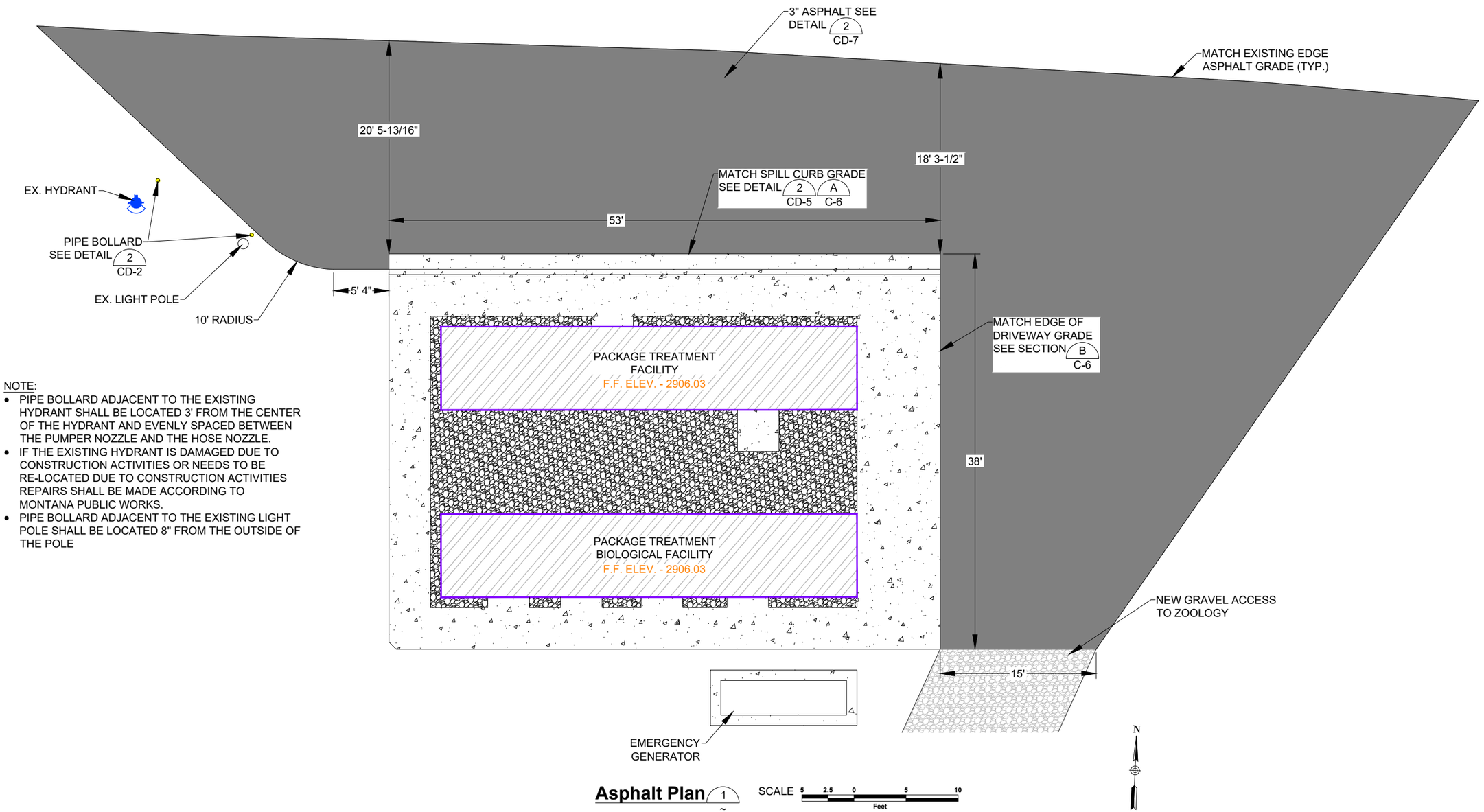
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Facility Concrete Sidewalk Sections

Sheet
C-6



NOTE:

- PIPE BOLLARD ADJACENT TO THE EXISTING HYDRANT SHALL BE LOCATED 3' FROM THE CENTER OF THE HYDRANT AND EVENLY SPACED BETWEEN THE PUMPER NOZZLE AND THE HOSE NOZZLE.
- IF THE EXISTING HYDRANT IS DAMAGED DUE TO CONSTRUCTION ACTIVITIES OR NEEDS TO BE RE-LOCATED DUE TO CONSTRUCTION ACTIVITIES REPAIRS SHALL BE MADE ACCORDING TO MONTANA PUBLIC WORKS.
- PIPE BOLLARD ADJACENT TO THE EXISTING LIGHT POLE SHALL BE LOCATED 8" FROM THE OUTSIDE OF THE POLE

MONTANA ADAM ECKHART 20032PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
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Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Facility Asphalt Plan**

Sheet: **C-7**

Zoology Gravel Access Plan (1)

SCALE 5 2.5 0 5 10 Feet

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MONTANA ADAM E. ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

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Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Zoology Gravel Access Plan

Sheet
C-8

NOTES:
- UTILITY CROSSING ELEVATIONS ARE APPROXIMATE
- ALL LANDSCAPING AFFECTED BY CONSTRUCTION SHALL BE REPLACED TO ORIGINAL OR BETTER CONDITION

EX. MH #13
RIM - 2903.84
INV. IN E 6" PVC - 2899.48
INV. OUT S 6" PVC - 2899.39

BIO STATION LANE

SEE ELECTRICAL SHEETS FOR POWER RE-ROUTING

NEW MH #12 (48" DIA.)
RIM - 2905.94
INV. IN S 8" DI - 2900.56
INV. OUT W 6" PVC- 2900.46

ABANDON & INSTALL NON-SHRINK GROUT IN THE END OF 6" SEWER EAST OF THE NEW MANHOLE

THERE SHALL BE A FULL STICK OF DI PIPE USED TO CONNECT TO THE MANHOLE SO THE JOINT IN THE DI PIPE IS A MAXIMUM DISTANCE FROM THE WATER CROSSING

8" DI PIPE

LIFT STATION
TREATED EFFLUENT
INV. IN 6" PVC - 2896.01

LIFT STATION RAW
INFLUENT
INV. IN 8" PVC - 2896.76

LIFT STATION

PRIMARY
SETTLING TANK

SLUDGE HOLDING TANK

PACKAGE TREATMENT
FACILITY

0+00

N

5 2.5 0 5 10
Feet

STA. 0+00
8" DI MJ 90° BEND
INV. ELEV. - 2900.70
STA. 0+16.5
EX. PHONE CROSSING
STA. 0+18.0
EX. POWER CROSSING
STA. 0+19.4
EX. FIBER CROSSING
STA. 0+21.3
EX. PHONE CROSSING
STA. 0+26.8
EX. WATER CROSSING
STA. 0+34.24
NEW MH 12
RIM - 2905.94
INV. IN S 8" DI - 2900.56
INV. OUT W 6" PVC - 2900.46

GROUND ELEVATION

34.2 LF - 8"
DI AT 0.4%

INSTALL RIGID INSULATION FROM THE 90° BEND TO THE NEW MH - SEE DETAIL 3 CD-2

2930 2925 2920 2915 2910 2905 2900 2895 2890 2885

0+00 0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00 5+50 6+00 6+50

Revision	Date	By
Draft	8-7-23	AE
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Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
New Sewer Extension Plan & Profile

Sheet
C-9

X:\FLATHEAD LAKE BIOLOGICAL STATION – WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\FLBS Border.dwg SAVED: 2/7/24 PRINTED: 5/8/19 BY: ADAM

NOTES:
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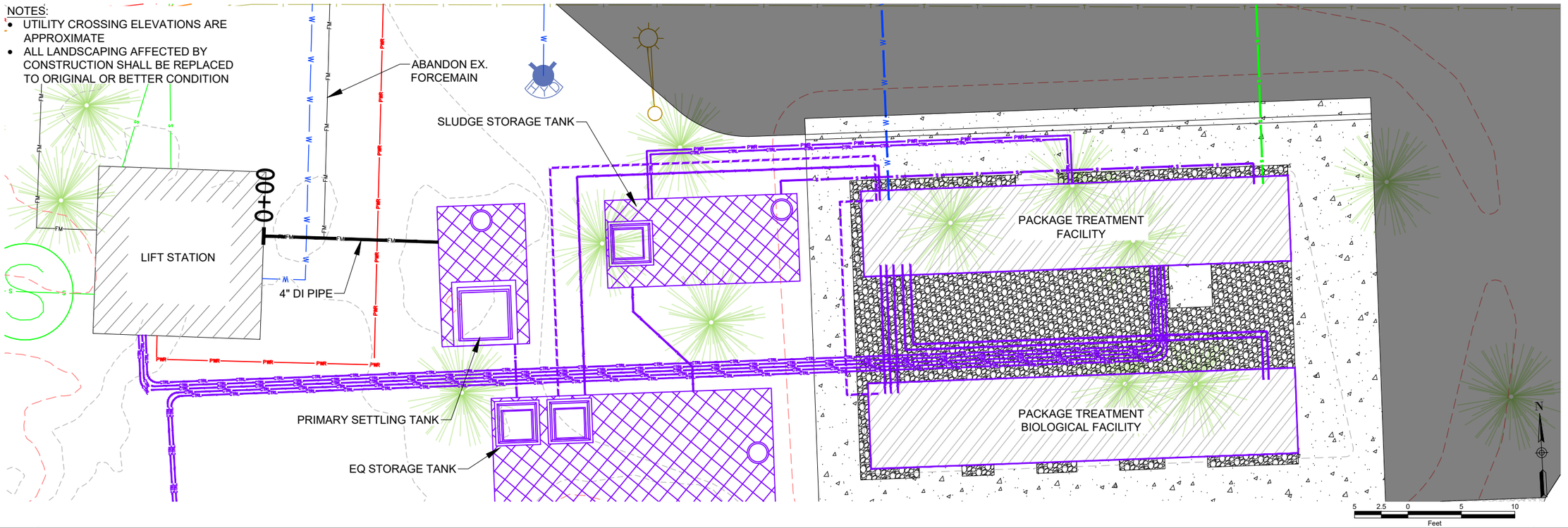
- ALL LANDSCAPING AFFECTED BY CONSTRUCTION SHALL BE REPLACED TO ORIGINAL OR BETTER CONDITION



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Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
New Forcemain LS to PST Plan & Profile

Sheet
C-10

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NOTES:

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- ALL LANDSCAPING AFFECTED BY CONSTRUCTION SHALL BE REPLACED TO ORIGINAL OR BETTER CONDITION

NEW 1" WATER SERVICE SADDLE, CORP STOP, AND SERVICE LINE TO NEW TREATMENT FACILITY SEE DETAIL 4 CD-7

NEW MH STRUCTURE

NEW ASPHALT ACCESS

TREATED EFFLUENT TO LIFT STATION

CONCRETE CURB & GUTTER

FORCEMAIN EXTENSION

PACKAGE TREATMENT MBR FACILITY

SLUDGE HOLDING TANK

CONCRETE SIDEWALK

PRIMARY SETTLING TANK

EQ TANK

PACKAGE TREATMENT BIOLOGICAL FACILITY

GRAVEL PERIMETER

2904'

2906'

2907'

New Water Service SCALE 5 2.5 0 5 10 Feet

N

X:\FLATHEAD LAKE BIOLOGICAL STATION – WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\Civil\C-11.dwg SAVED:12/11/23 PRINTED:2/7/24 BY:ADAM

MONTANA ADAM ECKHART 22012PE LICENSED PROFESSIONAL ENGINEER

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Drawn By: A.Eckhart, P.E.
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Designed By: A.Eckhart, P.E.

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Owner: Flathead Lake Biological Station

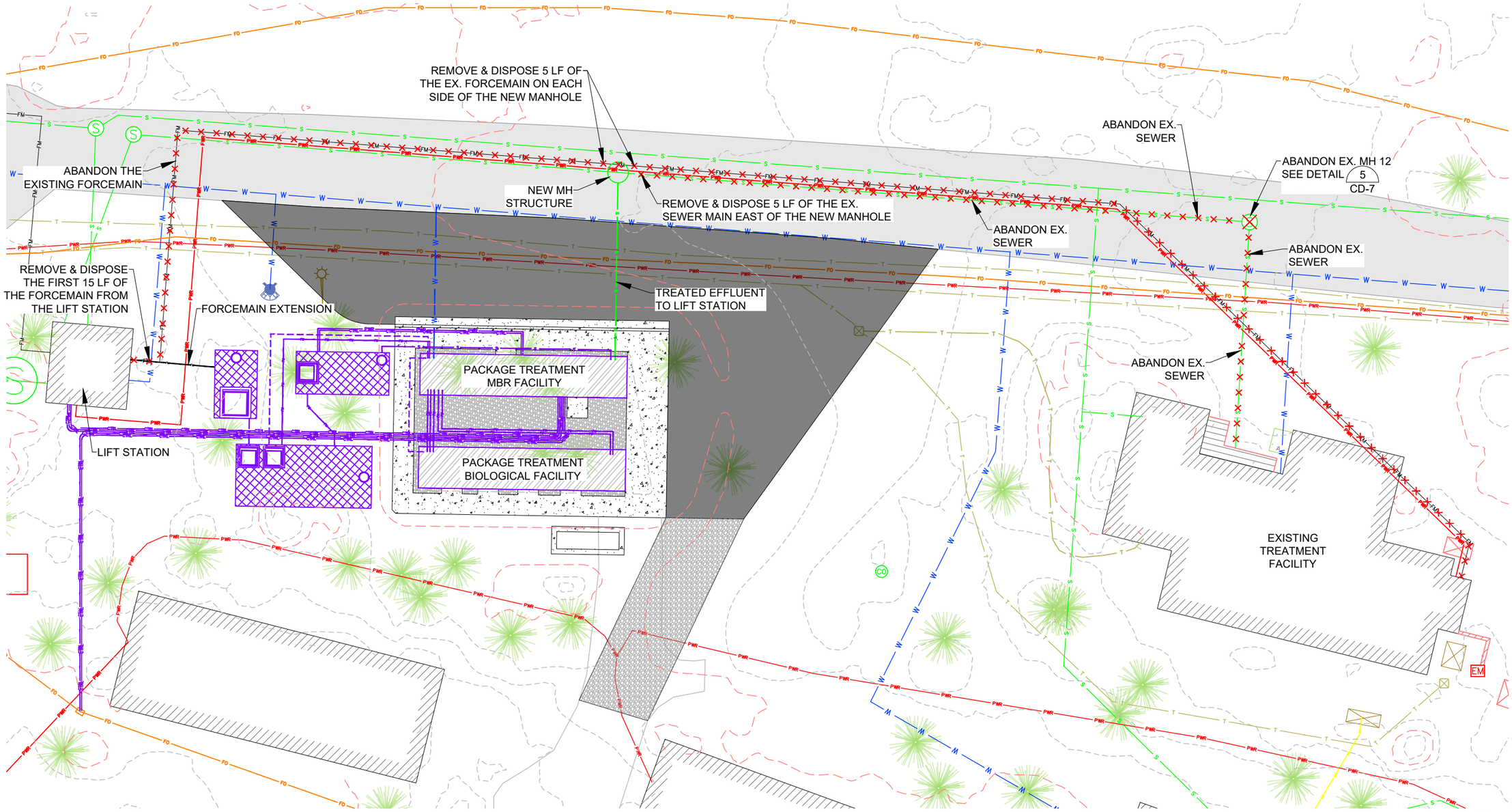
Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **New Water Service**

Sheet: **C-11**

NOTES:

- ALL ABANDONED SEWERS SHALL BE FILLED WITH SAND (PUMPED). THE ENDS OF THE SEWERS SHALL BE GROUTED SHUT TO RETAIN THE SAND.
- ALL PIPING ABANDONMENTS THAT INTERFACE WITH A BUILDING STRUCTURE SHALL BE CUT AND PLUGGED WITH GROUT 5 LF FROM THE BUILDING. THE 5 FOOT STICK TOWARDS THE BUILDING SHALL BE GROUTED SHUT.
- ABANDONMENT SHALL BE COORDINATED TO ALLOW CONTINUED TREATMENT OF WASTEWATER. BYPASS PUMPING MAY BE REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
- SEE ELECTRICAL SHEETS FOR POWER ABANDONMENT/RE-ROUTING.



Demolition Plan SCALE 10 5 0 10 20 Feet

MONTANA ADAM ECKHART 20032PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
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Designed By: A.Eckhart, P.E.

Engineer
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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Demolition Plan

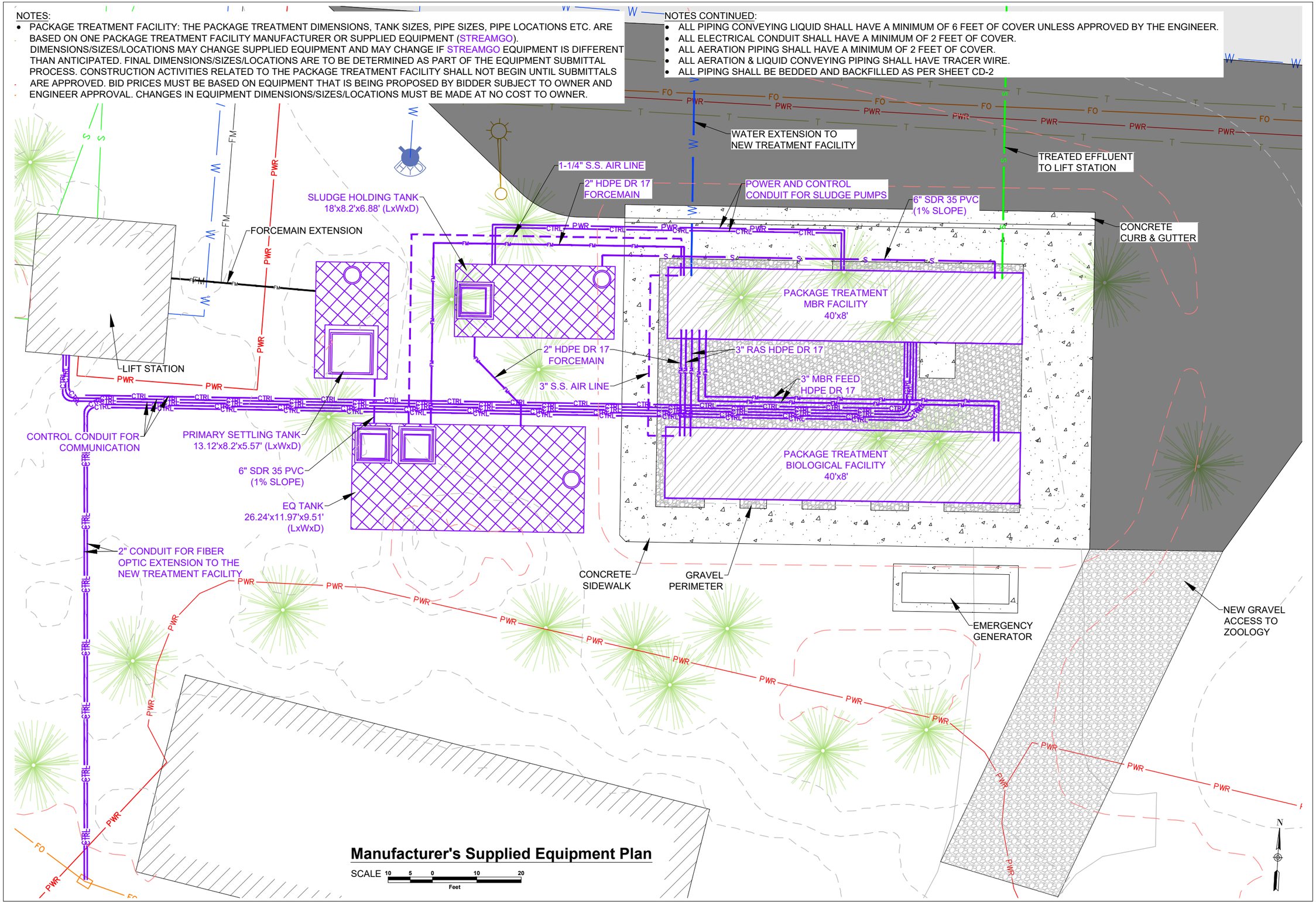
Sheet
C-12

NOTES:

- PACKAGE TREATMENT FACILITY: THE PACKAGE TREATMENT DIMENSIONS, TANK SIZES, PIPE SIZES, PIPE LOCATIONS ETC. ARE BASED ON ONE PACKAGE TREATMENT FACILITY MANUFACTURER OR SUPPLIED EQUIPMENT (STREAMGO). DIMENSIONS/SIZES/LOCATIONS MAY CHANGE SUPPLIED EQUIPMENT AND MAY CHANGE IF STREAMGO EQUIPMENT IS DIFFERENT THAN ANTICIPATED. FINAL DIMENSIONS/SIZES/LOCATIONS ARE TO BE DETERMINED AS PART OF THE EQUIPMENT SUBMITTAL PROCESS. CONSTRUCTION ACTIVITIES RELATED TO THE PACKAGE TREATMENT FACILITY SHALL NOT BEGIN UNTIL SUBMITTALS ARE APPROVED. BID PRICES MUST BE BASED ON EQUIPMENT THAT IS BEING PROPOSED BY BIDDER SUBJECT TO OWNER AND ENGINEER APPROVAL. CHANGES IN EQUIPMENT DIMENSIONS/SIZES/LOCATIONS MUST BE MADE AT NO COST TO OWNER.

NOTES CONTINUED:

- ALL PIPING CONVEYING LIQUID SHALL HAVE A MINIMUM OF 6 FEET OF COVER UNLESS APPROVED BY THE ENGINEER.
- ALL ELECTRICAL CONDUIT SHALL HAVE A MINIMUM OF 2 FEET OF COVER.
- ALL AERATION PIPING SHALL HAVE A MINIMUM OF 2 FEET OF COVER.
- ALL AERATION & LIQUID CONVEYING PIPING SHALL HAVE TRACER WIRE.
- ALL PIPING SHALL BE BEDDED AND BACKFILLED AS PER SHEET CD-2



Manufacturer's Supplied Equipment Plan

SCALE 10 5 0 10 20 Feet

X:\FLATHEAD LAKE BIOLOGICAL STATION – WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\civil\C-13.dwg SAVED:12/11/23 PRINTED:2/7/24 BY:ADAM

MONTANA ADAM EICKHART 60329PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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Manufacturer's Supplied Equipment

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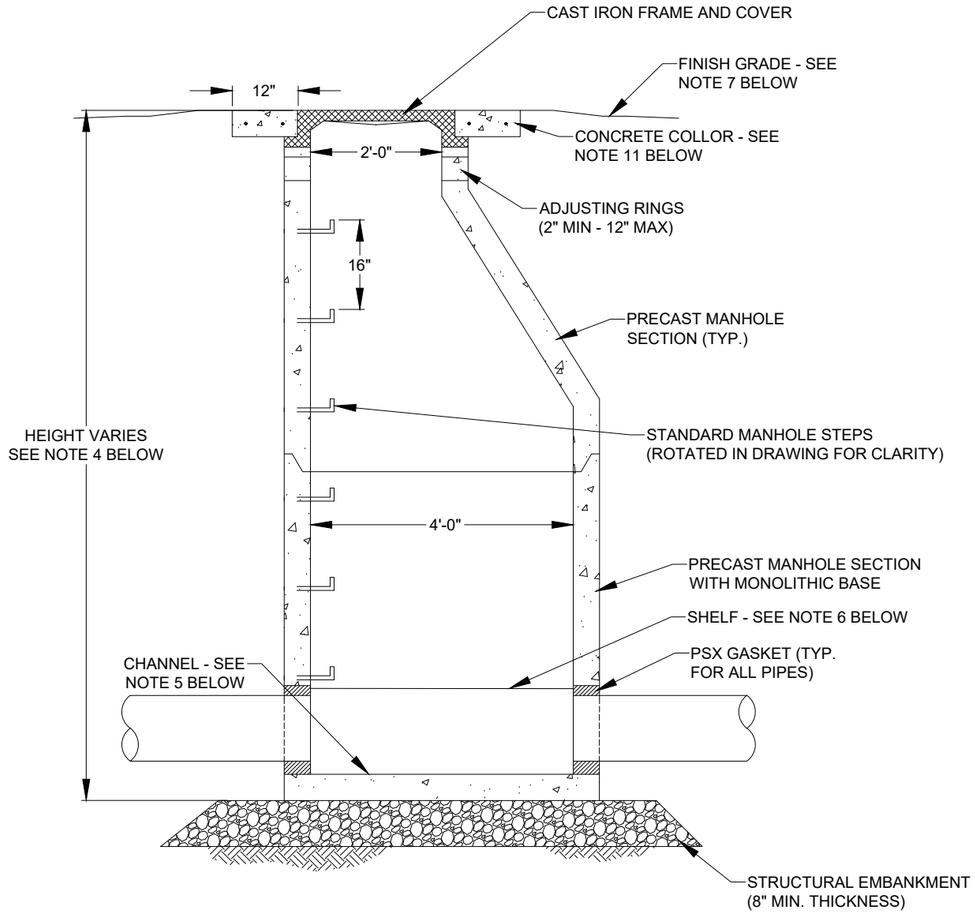
C-13

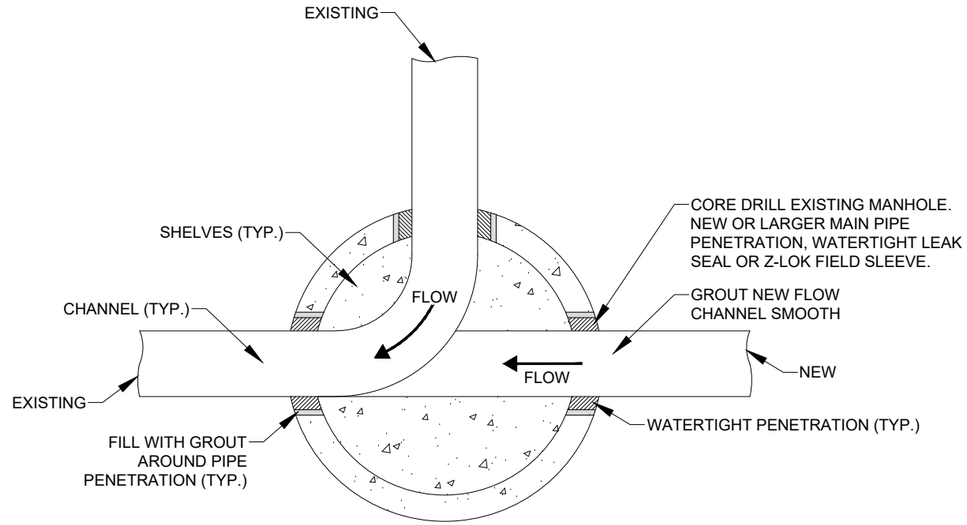


NOTES:

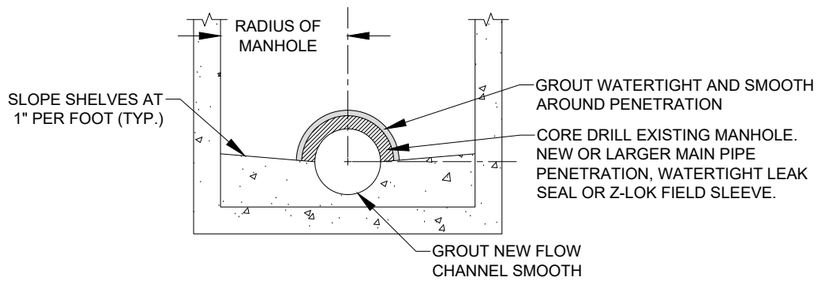
1. PRECAST CONCRETE MANHOLES SHALL CONFORM TO ASTM C478.
2. ALL JOINTS SHALL BE WATERTIGHT. MATERIAL SHALL BE RUBBER-NEK OR APPROVED EQUAL.
3. MANHOLE COVER SHALL BE UNMARKED.
4. SEE PLAN AND PROFILE SHEETS FOR MANHOLE DIMENSIONS. IF MANHOLE IS LESS THAN 7'-0", OMIT ECCENTRIC CONE AND PROVIDE PRECAST RISER SECTION AND COVER SLAB.
5. CHANNEL SHALL BE HALF THE DIAMETER OF THE PIPE.
6. CONCRETE SHELVES SHALL SLOPE TOWARD THE CHANNEL(S) AT 1" PER FOOT.
7. PROVIDE FILL MATERIAL, SLOPED AT 2 HORIZONTAL TO 1 VERTICAL FOR COVERS SET ABOVE EXISTING GROUND LEVEL.
8. CONSTRUCT SHELVES PER LATEST EDITION OF MPW.
9. PROVIDE 3" GROUT SPACE AROUND ALL PIPE. ALL JOINTS SHALL BE GROUTED WATERTIGHT. CONFORM TO MANHOLE LINER MANUFACTURER'S RECOMMENDATIONS.
10. NEW MANHOLES SHALL BE COATED WITH AN EXTERIOR DAMPPROOFING; BITUMINOUS COAT OR COAL TAR EPOXY.
11. CONTRACTOR SHALL INSTALL 12" CONCRETE COLLAR (6" THICK) AROUND COVER. REINFORCE WITH #3 REBAR HOOPS SPACED EVENLY WITHIN COLLAR, MINIMUM 2" CLEAR COVER.
12. FINISHED MANHOLES SHALL BE IN ACCORDANCE WITH LATEST EDITION OF MPWSS STANDARD SPECIFICATIONS.
13. STEPS SHALL BE PLACED AT 90° TO THE LINE OF SEWER PIPE WHERE APPLICABLE. STEPS ARE ROTATED IN DRAWING FOR CLARITY.
14. PROVIDE ALL SHORING NECESSARY TO PROTECT EXISTING STRUCTURES AND INFRASTRUCTURE.

Standard Sanitary Sewer Manhole (1)

NO SCALE



CONFIGURATION MAY VARY



CHANNEL SECTION

NOTES:

- SLOPE ALL SHELVES TO CHANNEL AT 1" PER FOOT.
- ALL NEW HOLES SHALL BE CORED AND LARGE ENOUGH FOR WATERTIGHT SEAL. GROUT SEAL IN PLACE WITH NON-SHRINK GROUT.
- ROTATE CONE AND STAIRS SUCH THAT STAIRS ARE NOT ABOVE CHANNELS.
- RECONSTRUCT FLOW CHANNEL IN ACCORDANCE WITH MPWSS STANDARD DRAWING NO. 02720-7.
- MANHOLE CONFIGURATIONS MAY VARY FROM DETAIL DEPICTED ABOVE.

Modify Existing Manhole (2)

NO SCALE

MONTANA ADAM ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

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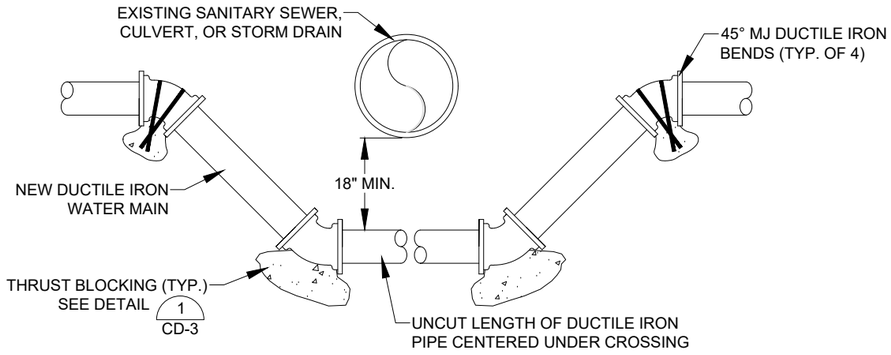
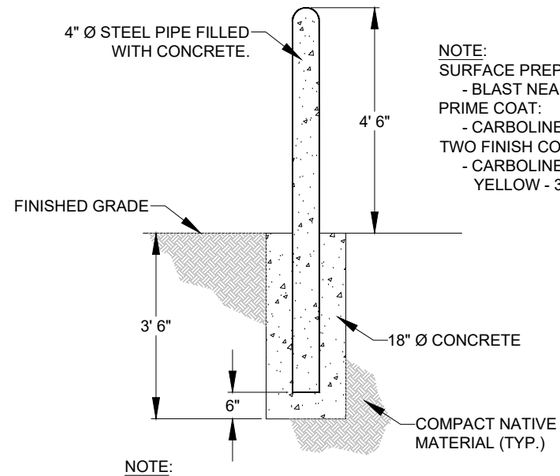
Manhole Details

Sheet
CD-1



NOTE:
DURING CROSSINGS, STRUCTURAL SUPPORT OF THE SEWER OR STORM DRAIN SHALL BE PROVIDED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING DAMAGE TO ANY EXISTING PIPES. IF AN EXISTING PIPE IS DAMAGED DUE TO CONTRACTOR NEGLIGENCE, THE PIPE SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE OWNER.

Vertical Pipe Adjustment (1)
NO SCALE



NOTE:
SURFACE PREPARATION:
- BLAST NEAR-WHITE
PRIME COAT:
- CARBOLINE CARBOCOAT 150-3.0 MIL DFT.
TWO FINISH COATS:
- CARBOLINE CARBOCOAT 30 OSHA YELLOW - 3.0 MIL DFT TOTAL

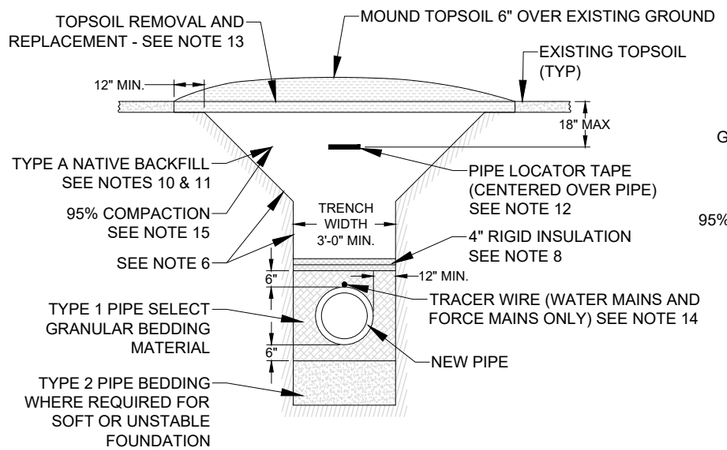
NOTE:
- BUILDING FACE, CONCRETE PADS, OR OTHER DRIVING HAZARDS SHALL BE A MINIMUM OF 12" FROM THE CENTERLINE OF PIPE BOLLARD.
- BOLLARDS LOCATED INSIDE BUILDINGS SHALL BE REMOVABLE.

Typical Pipe Bollard Detail (2)
NO SCALE — C-7

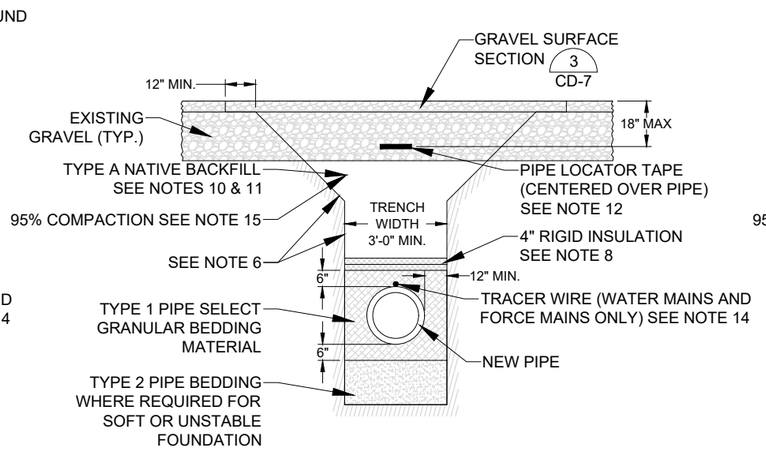
NOTES:
1. WHERE TRENCH PASSES THROUGH UNIMPROVED SURFACES: THE TOPSOIL SHALL BE REMOVED AND REPLACED A MINIMUM OF 12" FROM THE EDGE OF THE TRENCH OPENING.
2. WHERE TRENCH PASSES THROUGH EXISTING GRAVEL: THE GRAVEL SHALL BE REMOVED AND REPLACED A MINIMUM OF 12" FROM THE EDGE OF THE TRENCH OPENING.
3. WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT: THE PAVEMENT SHALL BE CUT ALONG A NEAT VERTICAL LINE A MINIMUM OF 12" FROM THE EDGE OF THE TRENCH OPENING, JUST PRIOR TO PAVING.
4. WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT: SAWCUT THE ASPHALT ALONG A NEAT VERTICAL LINE PER LIMITS SHOWN ON THE PLANS, JUST PRIOR TO PAVING. WHERE IMPORTED TRENCH BACKFILL IS NOT USED, SEPARATION/STABILIZATION FABRIC, PROPEX GEOTEX 801 NON-WOVEN GEOTEXTILE FABRIC OR APPROVED EQUAL WILL BE USED.
5. VERIFY THAT COMPACTION METHODS ARE COMPARABLE WITH PIPE MANUFACTURER'S RECOMMENDATIONS. ANY DAMAGE TO THE PIPE WILL BE THE CONTRACTOR'S RESPONSIBILITY.

NOTES CONTINUED:
6. TRENCH SHALL BE CONSTRUCTED TO OSHA SPECIFICATIONS FOR EXCAVATION. DRAWINGS DO NOT SHOW TRENCH DIMENSIONS OR BACK-SLOPES THAT MAY BE REQUIRED. CONTRACTOR REQUIRED TO DETERMINE WHICH OSHA SPECIFICATIONS ARE APPLICABLE.
7. ALL SPOILS SHALL BE REMOVED AND DISPOSED OF AT AN APPROVED LOCATION.
8. INSTALL 4" OF RIGID INSULATION THE FULL WIDTH OF THE TRENCH IN AREAS SHOWN ON PLANS.
9. ALL ROCKS GREATER THAN 12" IN ANY DIMENSION SHALL BE HAULED OFF SITE AND DISPOSED OF PROPERLY.
10. NO ROCKS OR LUMPS LARGER THAN 2" IN ANY DIMENSION SHALL BE ALLOWED WITHIN 6" OF THE PIPE.
11. USE SUITABLE NATIVE MATERIAL FOR BACKFILL. SEE TECHNICAL SPECIFICATIONS FOR CONDITIONS REQUIRING IMPORTED TRENCH BACKFILL.

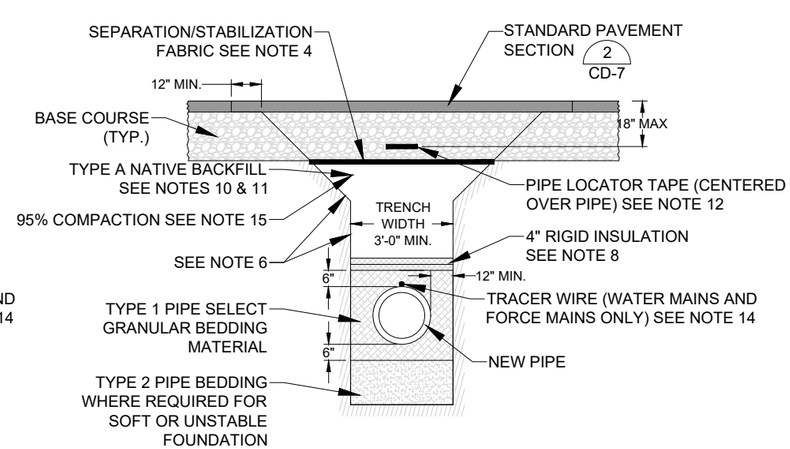
NOTES CONTINUED:
12. USE LABELED AND COLOR-CODED TAPE FOR THE APPROPRIATE UTILITY PIPE, PLACED 18" MAXIMUM BELOW FINISHED SURFACE.
13. SEED, FERTILIZE, AND MULCH ALL DISTURBED AREAS WHICH ARE NOT PAVED, CONCRETED, SODDED, OR GRAVELED PER SPECIFICATIONS.
14. FOR WATER MAINS AND FORCE MAINS TRACER WIRE SHALL BE TAPED TO TOP OF ALL PLASTIC PIPE (PVC, POLYTHYLENE, AND HDPE) AND BROUGHT UP FIRE HYDRANTS AND VALVE PIPE CASINGS.
15. COMPACTION REFERS TO PERCENT OF MAXIMUM DENSITY DETERMINED BY A STANDARD PROCTOR. ASTM D698-91. TRENCHES EXCEEDING 10 FEET IN DEPTH SHALL BE COMPACTED TO 98% OF MAXIMUM DENSITY PER ASTM D698-91.
16. FINISHED GRADE MUST MATCH THE ORIGINAL EXISTING GRADE WHERE PIPE IS INSTALLED UNLESS OTHERWISE NOTED.
17. REFER TO GENERAL NOTES FOR ADDITIONAL REQUIREMENTS.



UNIMPROVED SURFACE



GRAVELED SURFACE



PAVED SURFACE

Pipe Bedding & Backfill Details (3)
NO SCALE

MONTANA ADAM ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

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Draft	8-7-23	AE
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Civil Details

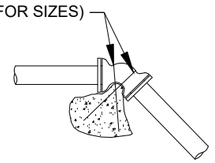
Sheet
CD-2

NOTES:
1. KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES
2. POUR THRUST BLOCKING AGAINST 3/4" MINUS GRAVEL OR STRUCTURAL FILL. 3/4" MINUS GRAVEL OR STRUCTURAL FILL SHALL BE AGAINST UNDISTURBED EARTH.
3. REQUIRED VOLUMES AND BEARING AREAS SHALL BE AS SHOWN IN THE TABLE AND ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS OF 2,000 LBS/SQFT.
4. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE = 4,050 LBS PER CUBIC YARD. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES USE THE FOLLOWING EQUATION:
   ACTUAL VOLUME = (TEST PRESSURE/150) X (TABLE VOLUME).
5. BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG AND AN ALLOWABLE SOIL BEARING STRESS OF 2,000 LBS/SQFT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES US THE FOLLOWING EQUATION:
   $B_1 = B(13.33)(P_1 / 2000)$ WHERE:
   P_1 = ACTUAL TEST PRESSURE, PSIG
   B = COMPUTED BEARING AREA
   B = BEARING AREA FROM TABLE
6. VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS AND HORIZONTAL BENDS, HAVE THE SAME THRUST BLOCK REQUIREMENTS.
7. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ELSEWHERE IN THESE PLANS TAKE PRECEDENCE OVER THIS STANDARD DETAIL.
8. THRUST BLOCK BEARING AREA SHALL NOT BE LESS THAN 1.0 SQFT.
9. TEST PRESSURES ARE INDICATED IN THE SPECIFICATIONS AND THE ALLOWABLE SOIL BEARING STRESS IS 2,000 LBS/SQFT.
10. THE USE OF RESTRAINED JOINT SYSTEMS WILL BE ACCEPTED AS AN ALTERNATIVE TO CONVENTIONAL CONCRETE THRUST BLOCKING.
11. **CONTRACTOR SHALL PROVIDE THRUST BLOCKING FOR ALL BURIED FITTINGS AND VALVES.**

VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)			
FITTING SIZE (INCHES)	BEND ANGLE		
	45°	22-1/2°	11-1/4°
4	0.8	0.3	0.1
6	2.0	0.8	0.3
8	3.0	1.1	0.4
10	4.5	1.7	0.7
12	5.4	2.4	1.0
14	8.6	3.2	1.3
16	11.1	4.2	1.7
18	14.1	5.3	2.2
20	17.3	6.6	2.7
24	24.2	9.2	3.8

VERTICAL BEND REBAR		
FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14" - 16"	#8	36"
18" - 20"	#10	36"
24"	#11	42"

NOTE:
EPOXY COATED REBAR OVER FITTING AND EMBEDDED IN CONCRETE (SEE TABLE FOR SIZES)

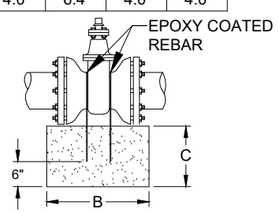


BEARING AREA OF THRUST BLOCKS IN SQFT. (HORIZONTAL BENDS)							
FITTING SIZE (INCHES)	TEE, WYE, PLUG, OR CAP	90° BEND, PLUGGED CROSS	TEE, PLUGGED RUN		BEND ANGLE		
			A_1	A_2	45°	22-1/2°	11-1/4°
4	1.3	1.8	1.3	1.8	1.0	1.0	--
6	3.0	4.2	3.0	4.2	2.3	1.2	1.0
8	5.3	7.6	5.3	7.6	4.1	2.1	1.0
10	8.3	11.8	8.3	11.8	6.4	3.3	1.6
12	12.0	17.0	12.0	17.0	9.2	4.7	2.4
14	16.3	23.1	16.3	23.1	12.5	6.4	3.2
16	21.4	30.2	21.4	30.2	16.3	8.3	4.2
18	27.0	32.0	27.0	32.0	20.7	10.5	5.3
20	33.4	47.2	33.4	47.2	25.5	13.0	6.5
24	40.3	55.0	40.3	55.0	35.7	18.0	9.0

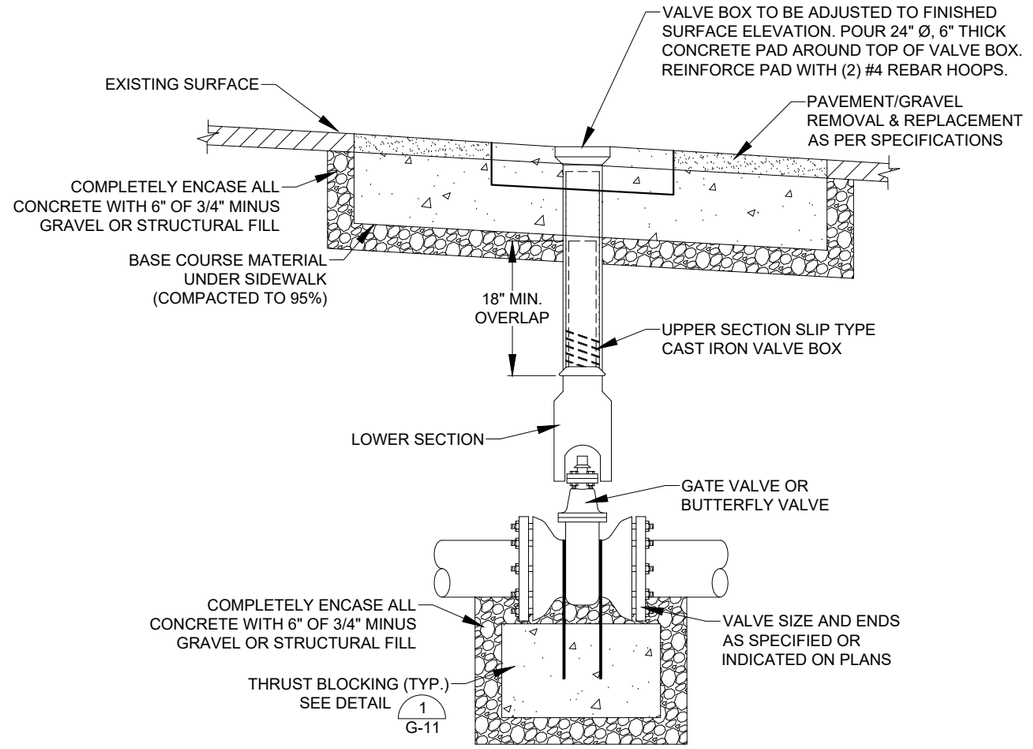
NOTE:
* EACH AREA (A/2) IS HAVE OF TABULATED TOTAL AREA
** RESTRAINED PLUG

VALVE THRUST BLOCK DIMENSIONS							
VALVE SIZE	REBAR SIZE	100 PSI			150 PSI		
		A	B	C	A	B	C
4"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
6"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
8"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
10"	#6	2.0'	2.0'	2.0'	2.5'	2.5'	2.0'
12"	#6	2.3'	2.0'	2.0'	3.0'	3.0'	2.7'
14"	#8	2.3'	2.0'	2.3'	3.4'	3.0'	3.0'
16"	#9	3.0'	3.0'	2.9'	4.3'	3.0'	3.0'
18"	#10	3.7'	3.0'	3.0'	5.4'	3.0'	3.0'
20"	#10	3.9'	3.3'	3.3'	5.7'	3.3'	3.3'
24"	#11	4.3'	4.0'	4.0'	6.4'	4.0'	4.0'

NOTE:
DIMENSION 'A' IS WIDTH OF THRUST BLOCK (PERPENDICULAR TO PAGE)

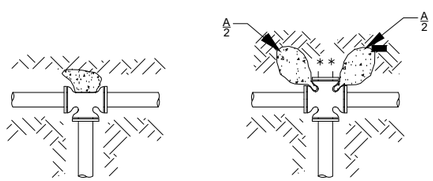


Thrust Block 1
NO SCALE ~

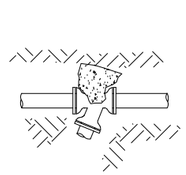


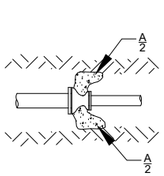
NOTE:
1. ALL VALVES AND FITTINGS SHALL BE POLYWRAPPED AND SEALED WITH 3M POLYTAPE OR APPROVED EQUAL.
2. NO PAYMENT SHALL BE MADE FOR ADJUSTMENT OF VALVE BOXES TO FINAL GRADE.
3. COMPACT ALL BACKFILL AROUND THE VALVE BOX UPPER SECTION BY MEANS OF HAND TAMPING.
4. CONTRACTOR SHALL PROVIDE OWNER WITH 1 VALVE WRENCH.
5. ALL CONCRETE AND CONCRETE THRUST BLOCKING SHALL BE ENCASED IN 3/4" MINUS GRAVEL OR STRUCTURAL FILL.

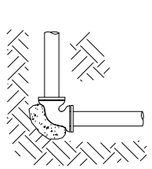
Valve Setting 2
NO SCALE ~

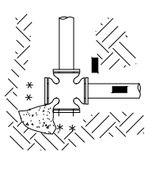

TEE

PLUGGED CROSS *


WYE


REDUCER FOR BEARING AREAS REFER TO 22-1/2° BEND


BEND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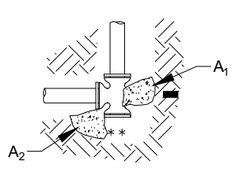
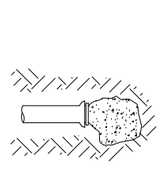


TEE, PLUGGED RUN


PLUG OR CAP

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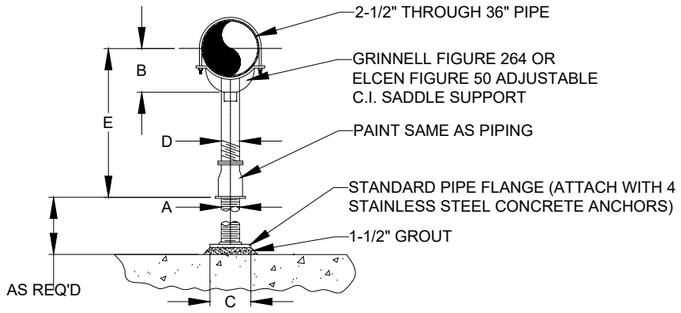
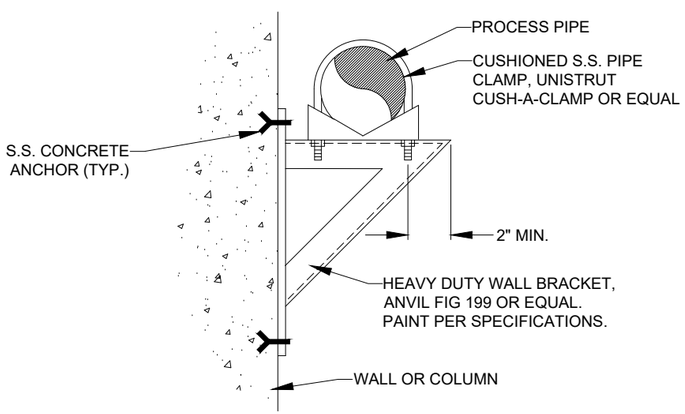
Sheet
CD-3



NOTES:
- PROVIDE NEOPRENE WAFFLE ISOLATION PAD. SIMILAR TO MASON TYPE "W" OR KORFUND KORPAD40. UNDER SUPPORT FOOT WHEN PIPING IS ISOLATED OR SUPPORT IS ADJACENT TO MECHANICAL EQUIPMENT.
- FOR BASE HEIGHT AND FLANGE DIMENSIONS, SEE TABLE BELOW.

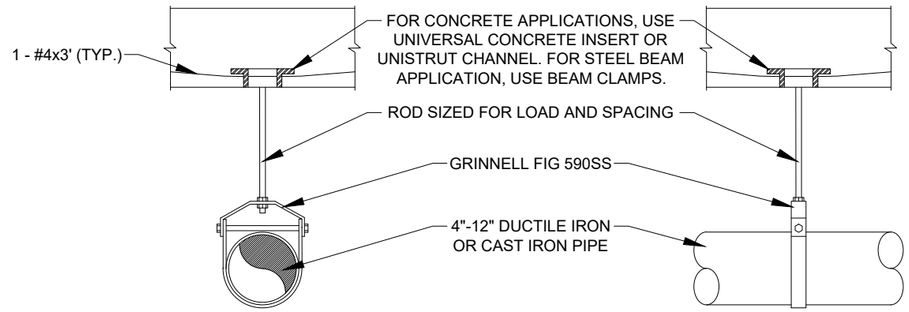
DIMENSION TABLE						
PIPE SIZE	A	B	C	D	E	
					MIN	MAX
2-1/2"	2-1/2"	3-1/2"	9"	1-1/2"	8"	13"
3"	2-1/2"	3-3/4"	9"	1-1/2"	8-1/4"	13-1/4"
3-1/2"	2-1/2"	4"	9"	1-1/2"	8-1/2"	13-1/2"
4"	3"	4-1/4"	9"	2-1/2"	9-1/4"	14"
5"	3"	4-7/8"	9"	2-1/2"	10"	14-3/4"
6"	3"	5-1/2"	9"	2-1/2"	10-1/2"	15-1/4"
8"	3"	6-7/8"	9"	2-1/2"	11-3/4"	16-1/2"
10"	3"	8-1/2"	9"	2-1/2"	13-1/2"	18-1/4"
12"	3"	9-15/16"	9"	2-1/2"	15"	19-3/4"
14"	4"	10-15/16"	11"	3"	16-1/4"	20-3/4"
16"	4"	12-3/8"	11"	3"	17-3/4"	22-1/4"

Pipe Support Detail (1)
NO SCALE



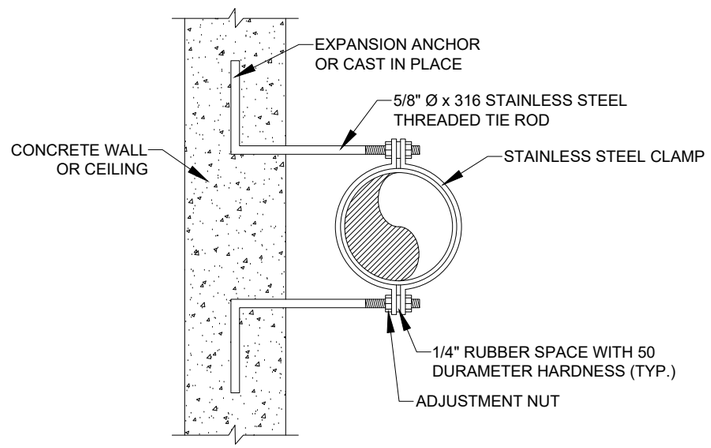
NOTE:
PROVIDE S.S. COMPONENTS FOR SUBMERGED APPLICATIONS OR WHEN SUPPORT IS INSIDE A BURIED STRUCTURE.

Heavy Duty Pipe Support (3)
NO SCALE



NOTE:
- TOTAL LOADING ON EACH CONCRETE INSERT OR OTHER TYPE HANGER ROD ANCHOR SHALL NOT EXCEED MANUFACTURER'S RECOMMENDED LOADING.
- FOR INSULATED PIPES, USE GRINNELL FIGURE 167 (INSULATION PROTECTION SHIELD).
- FOR STEEL PIPE USE GRINNELL FIGURE 260.

Typical Pipe Hanger (2)
NO SCALE



NOTES:
CLAMP, BOLTS AND NUTS TO BE STAINLESS STEEL AND SIZED AS REQUIRED.

Vertical Pipe Support (4)
NO SCALE

MONTANA ADAM ECKHART 20029E LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer

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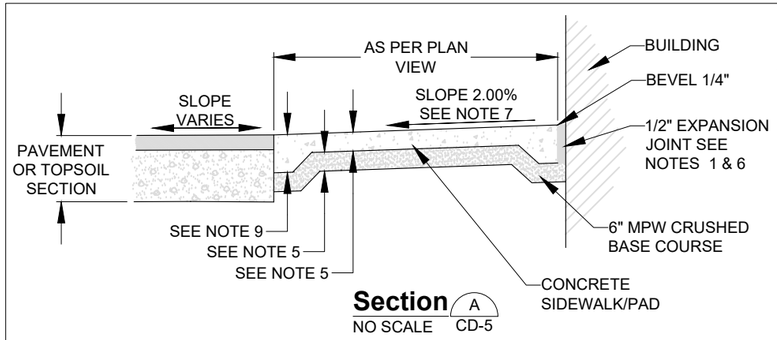
Owner: Flathead Lake Biological Station

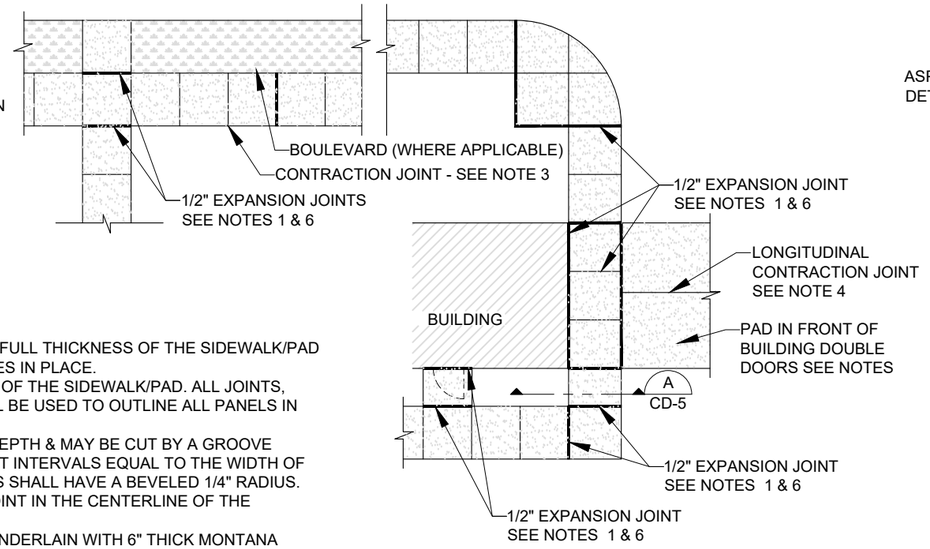
Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

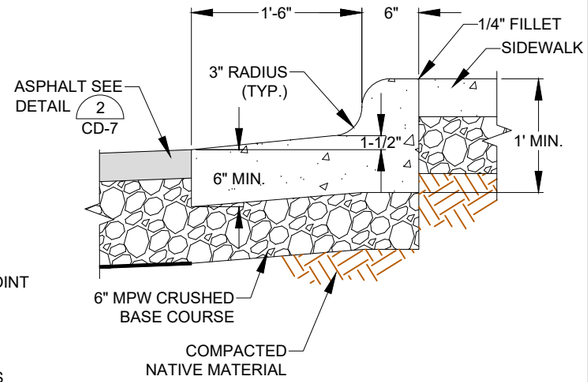
Sheet Title: **Pipe Support Details**

Sheet: **CD-4**



Section A CD-5
NO SCALE

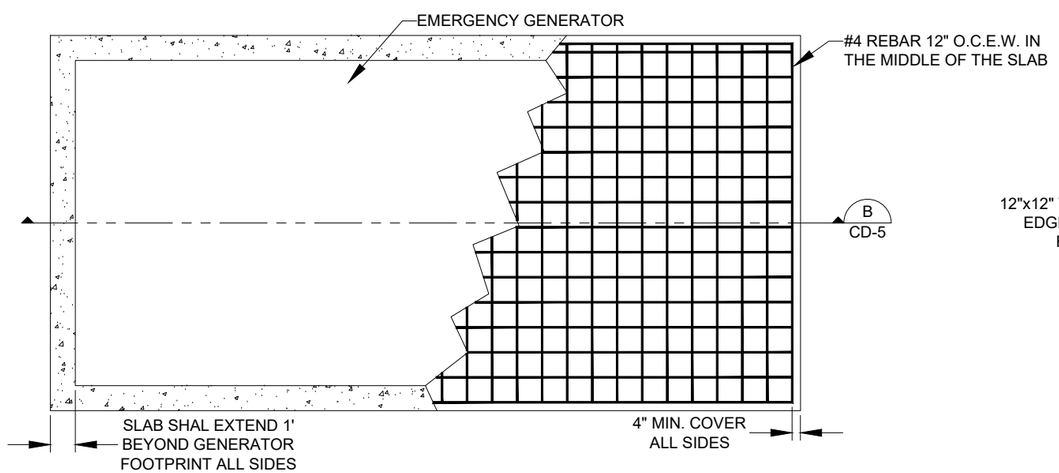




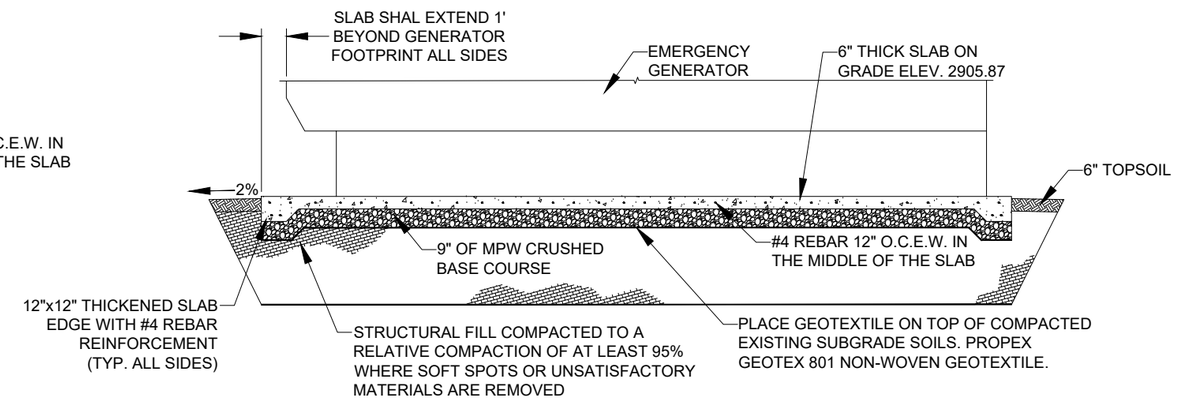
Concrete Spill Curb Section 2 C-5,C-6
NO SCALE

NOTES:
1. PREMOLDED JOINT FILLER (PMJF) SHALL BE INSTALLED AT EXPANSION JOINTS FOR THE FULL THICKNESS OF THE SIDEWALK/PAD & WILL BE USED AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK/PAD & STRUCTURES IN PLACE.
2. ALL JOINTS SHALL BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE & SURFACE OF THE SIDEWALK/PAD. ALL JOINTS, WHERE APPLICABLE, SHALL ALIGN WITH LIKE JOINTS IN ADJOINING WORK. JOINTS SHALL BE USED TO OUTLINE ALL PANELS IN THE SIDEWALK/PAD, WHICH SHALL BE, SO FAR AS POSSIBLE, SQUARE.
3. CONTRACTION JOINTS SHALL NOT BE MORE THAN 1/8" WIDE AND NOT LESS THAN 1" IN DEPTH & MAY BE CUT BY A GROOVE FORMING TOOL. CONTRACTION JOINTS WITHIN SIDEWALKS/PADS SHALL BE REQUIRED AT INTERVALS EQUAL TO THE WIDTH OF THE SIDEWALK/PAD OR CENTERLINE CONTRACTION JOINT WIDTH. CONTRACTION JOINTS SHALL HAVE A BEVELED 1/4" RADIUS.
4. ALL SIDEWALKS/PADS WIDER THAN 5'-0" SHALL HAVE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF THE SIDEWALK/PAD.
5. UNLESS OTHERWISE SPECIFIED, ALL SIDEWALKS/PADS SHALL BE 6" THICK & SHALL BE UNDERLAIN WITH 6" THICK MONTANA PUBLIC WORKS CRUSHED BASE COURSE AS SPECIFIED.
6. EXPANSION JOINTS IN SIDEWALKS/PADS SHALL BE REQUIRED AT 50'-0" INTERVALS O.C. FOR STRAIGHT SECTIONS. EXPANSION JOINTS ARE NECESSARY AT CHANGES IN SIDEWALK/PAD SLOPES, INTERCEPTS WITH DRIVEWAYS, OTHER SIDEWALKS/PADS & AT BEGINNING AND ENDING LOCATIONS ON EACH POINT-OF-CURVATURE FOR RADII GREATER THAN 10'-0".
7. SLOPE SIDEWALKS/PADS 2.00% TO GUTTER, AWAY FROM BUILDINGS, OR AS SPECIFIED ON GRADING PLAN.
8. SIDEWALK/PAD EDGES SHALL BE BACKFILLED IN SUCH A MANNER AS TO MATCH EXISTING OR NEW ADJACENT AREAS. UNLESS OTHERWISE SPECIFIED IN THESE PLANS; ALL DISTURBED AREAS, INCLUDING SIDEWALK/PAD BACKFILL AREAS, SHALL RECEIVE 4" OF APPROVED TOPSOIL COMPACTED TO 90% OF PROCTOR AND BROADCAST SEEDING WITH APPROVED NATIVE SEED.
9. THICKENED EDGE SHALL BE A MINIMUM OF 8" THICK FOR 4" THICK SIDEWALKS AND A MINIMUM OF 10" THICK FOR 6" THICK SIDEWALKS/PADS. THICKENED EDGES SHALL HAVE A MIN. OF TWO (2) #4 BARS (CONTINUOUS) RUNNING LONGITUDINALLY.
10. PADS SHALL HAVE A MIN. OF #4 BARS (CONTINUOUS) RUNNING LONGITUDINALLY 1' O.C.E.W.

Concrete Sidewalk and Pads 1 ~
NO SCALE



Emergency Generator Slab 3 C-2
NO SCALE



Emergency Generator Slab Section B CD-5
NO SCALE

NOTES:
- EXCAVATE AND REMOVE SURFICIAL TOPSOIL BENEATH THE SLAB FOOTPRINT. EXCAVATE AND REMOVE 9" OF MATERIAL BELOW THE BOTTOM OF THE SLAB ELEVATION. PROVIDE ENGINEER AN OPPORTUNITY TO INSPECT THE BOTTOM OF THE EXCAVATION. EXCAVATE SOFT SPOTS OR UNSATISFACTORY MATERIALS THAT ARE OBSERVED. MOISTURE CONDITION SUBGRADE SOILS TO PLUS OR MINUS 2% OF OPTIMUM MOISTURE CONTENT. COMPACT THE SUBGRADE SOILS TO A STANDARD RELATIVE COMPACTION (ASTM D698) OF AT LEAST 98%. COMPACTED EXCAVATION SURFACE SHOULD BE PROOF-ROLLED WITH HEAVY EQUIPMENT. REPLACE REMOVED SOFT SPOTS/UNSATISFACTORY MATERIAL WITH STRUCTURAL FILL IN 8" MAXIMUM LOOSE LIFTS TO DESIGN GRADE AND COMPACT TO A STANDARD RELATIVE COMPACTION OF AT LEAST 98%. STRUCTURAL FILL SHALL MEET MPW 1.5-INCH MINUS BASE COURSE. PLACE 9" OF MPW CRUSED BASE COURSE ON TOP OF STRUCTURAL FILL.
- GRADE AWAY FROM SLAB AT A MINIMUM OF 2% FOR 10 FEET.
- SEE ELECTRICAL DESIGN FOR GENERATOR SIZE
- MOUNT GENERATOR TO CONCRETE SLAB PER MANUFACTURER'S RECOMMENDATIONS.

MONTANA ADAM ECKHART 20022PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
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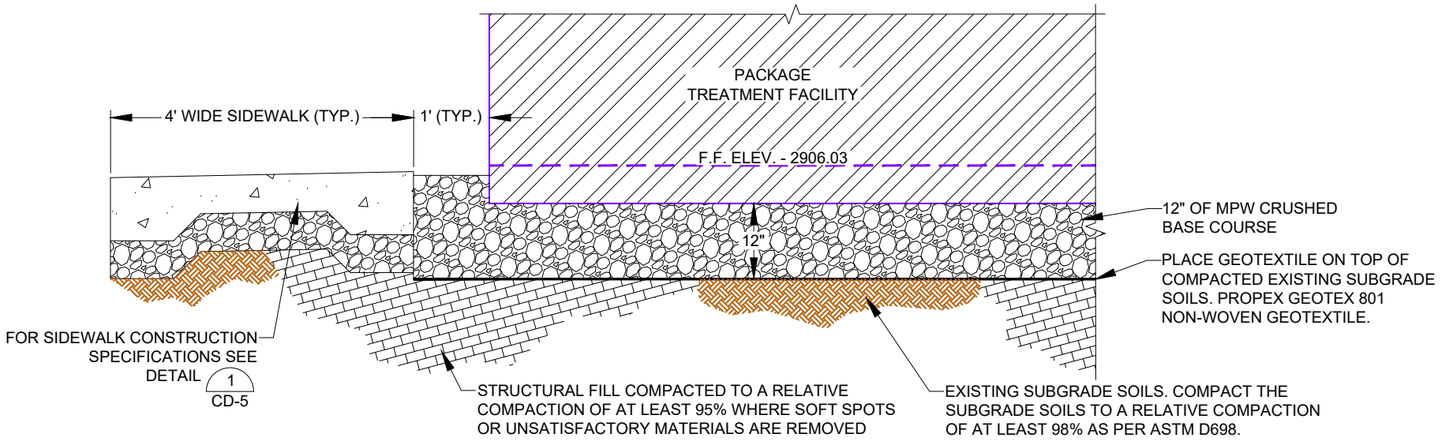
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Civil Details

Sheet
CD-5

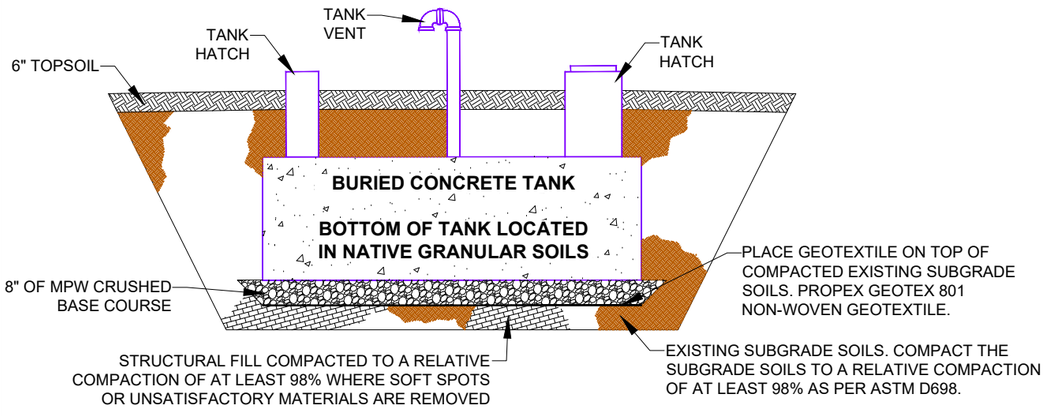


NOTES:

- EXCAVATE AND REMOVE SURFICIAL TOPSOIL BENEATH THE GRAVEL PAD FOOTPRINT TO DESIGN ELEVATION.
- PROVIDE ENGINEER AN OPPORTUNITY TO INSPECT THE BOTTOM OF THE EXCAVATION. EXCAVATE SOFT SPOTS OR UNSATISFACTORY MATERIALS THAT ARE OBSERVED.
- MOISTURE CONDITION SUBGRADE SOILS TO PLUS OR MINUS 2% OF OPTIMUM MOISTURE CONTENT. COMPACT THE SUBGRADE SOILS TO A STANDARD RELATIVE COMPACTION (ASTM D698) OF AT LEAST 98%.
- COMPACTED EXCAVATION SURFACE SHOULD BE PROOF-ROLLED WITH HEAVY EQUIPMENT. ENGINEER SHALL BE ALLOWED TO OBSERVE PROOF-ROLLING TO APPROVE COMPACTED SURFACE.
- PLACE AND COMPACT STRUCTURAL FILL TO DESIGN GRADE. PLACE FILL IN 8" MAXIMUM LOOSE LIFTS AND COMPACT TO A STANDARD RELATIVE COMPACTION OF AT LEAST 98%. STRUCTURAL FILL SHALL MEET MPW 1.5-INCH MINUS BASE COURSE.
- INSTALL PROPEX GEOTEX 801 NON-WOVEN GEOTEXTILE BETWEEN COMPACTED SUBGRADE AND BASE COURSE.
- PLACE AND COMPACT 12" OF MPW CRUSHED BASE COURSE TO A RELATIVE COMPACTION OF AT LEAST 98%
- GRADE AWAY FROM SLAB AT A MINIMUM OF 2% FOR 10 FEET.

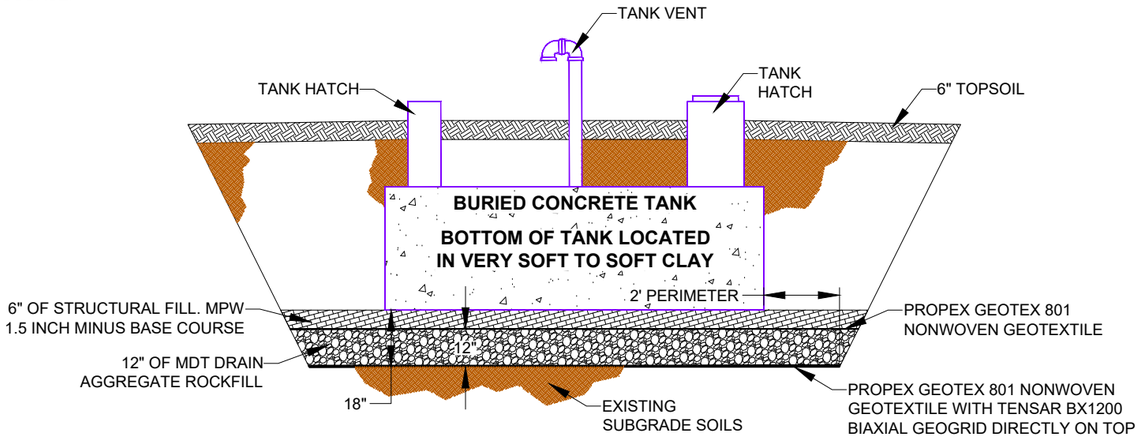
Package Treatment Facility Subgrade Requirements (1)

SCALE 1 0.5 0 1 2 Feet



NOTES FOR BURIED CONCRETE TANK LOCATED IN NATIVE GRANULAR SOILS:

- EXCAVATE TO DESIGN GRADE. DEWATER IF WARRANTED.
- PROVIDE ENGINEER AN OPPORTUNITY TO INSPECT THE BOTTOM OF THE EXCAVATION. EXCAVATE SOFT SPOTS OR UNSATISFACTORY MATERIALS THAT ARE OBSERVED.
- MOISTURE CONDITION SUBGRADE SOILS TO ± 2% OF OPTIMUM MOISTURE CONTENT. COMPACT THE SUBGRADE SOILS TO A STANDARD RELATIVE COMPACTION (ASTM D698) OF AT LEAST 95%.
- PLACE AND COMPACT STRUCTURAL FILL TO DESIGN GRADE WHERE SOFT/UNSUITABLE MATERIALS WERE REMOVED. PLACE FILL IN 8" MAXIMUM LOOSE LIFTS AND COMPACT TO A STANDARD RELATIVE COMPACTION OF AT LEAST 98%. STRUCTURAL FILL SHALL MEET MPW 1.5-INCH MINUS BASE COURSE.
- INSTALL PROPEX GEOTEX 801 NON-WOVEN GEOTEXTILE BETWEEN COMPACTED SUBGRADE AND BASE COURSE.
- PLACE AND COMPACT 8" OF MPW CRUSHED BASE COURSE TO A RELATIVE COMPACTION OF AT LEAST 98%
- GRADE AWAY FROM TANK AT A MINIMUM OF 2% FOR 10 FEET.



NOTES FOR BURIED CONCRETE TANK LOCATED IN VERY SOFT TO SOFT CLAY:

- DEWATER THE SITE AS REQUIRED FOR CONSTRUCTION.
- EXCAVATE AND REMOVE SOIL 18" BELOW THE BOTTOM OF THE PRECAST CONCRETE TANK. HORIZONTALLY, THE EXCAVATION SHALL EXTEND 2' BEYOND THE PERIMETER OF THE TANK.
- COMPACT SUBGRADE BY ONE OF THE FOLLOWING TWO METHODS:
  - IF SOIL AND MOISTURE CONDITIONS ALLOW, MOISTURE CONDITION THE SUBGRADE SOIL TO ± 2% OF OPTIMUM MOISTURE CONTENT AND COMPACT SUBGRADE TO A STANDARD RELATIVE COMPACTION OF AT LEAST 90% PER ASTM D698
  - IF SUBGRADE SOIL IS SATURATED AND PRONE TO PUMPING, COMPACT SUBGRADE WITH A MINIMUM OF FOUR PASSES OF A SHEEP'S FOOT ROLLER. DO NOT USE VIBRATORY COMPACTION. DISCONTINUE COMPACTION IF THE PROCESS IS DRAWING WATER UPWARD OR CAUSING PUMPING. DENSITY TESTING IS NOT REQUIRED.
- PLACE PROPEX GEOTEX 801 NONWOVEN GEOTEXTILE ACROSS THE COMPACTED SURFACE. PLACE TENSAR BX1200 BIAXIAL GEOGRID ON TOP OF THE WOVEN GEOTEXTILE.
- PLACE 12" OF ROCKFILL OVER THE GEOSYNTHETICS. COMPACT WITH A MINIMUM FOUR PASSES USING COMPACTION OR TRACKED EQUIPMENT. WITH ENGINEER APPROVAL, BUCKET COMPACTION IS AN ACCEPTABLE ALTERNATIVE TO ANY LOCATION EQUIPMENT CANNOT SAFELY ACCESS. ROCKFILL SHALL MEET THE MDT DRAIN AGGREGATE GRADATION.
- PLACE PROPEX GEOTEX 801 NONWOVEN GEOTEXTILE ACROSS THE COMPACTED ROCKFILL SURFACE.
- PLACE STRUCTURAL FILL TO DESIGN ELEVATION. PLACE IN 8" MAXIMUM LOOSE LIFTS AND COMPACT EACH LIFT TO A STANDARD RELATIVE COMPACTION OF AT LEAST 95%.
- GRADE AWAY FROM TANK AT A MINIMUM OF 2% FOR 10 FEET.

Buried Concrete Tank Subgrade Requirements (2)

NO SCALE

ADAM ECKHART COMPE
MONTANA LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
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Phone (406) 449-3303
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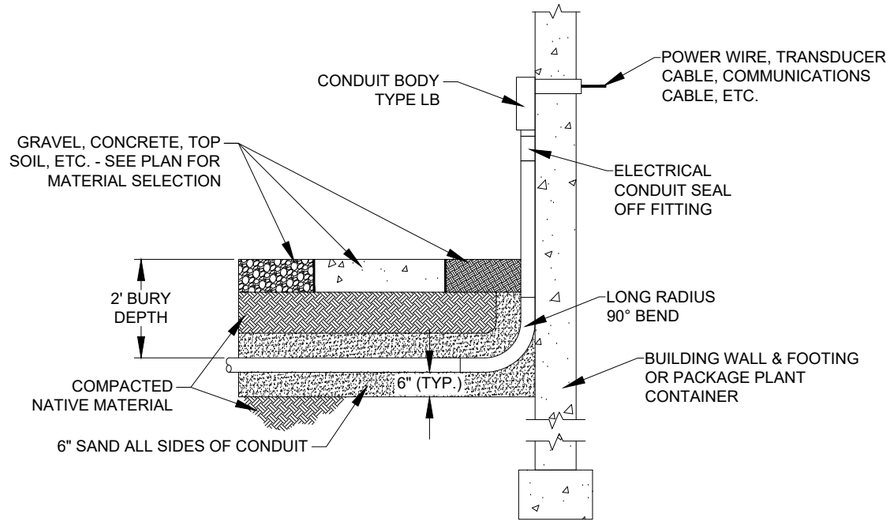
Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Subgrade Civil Details**

Sheet: **CD-6**

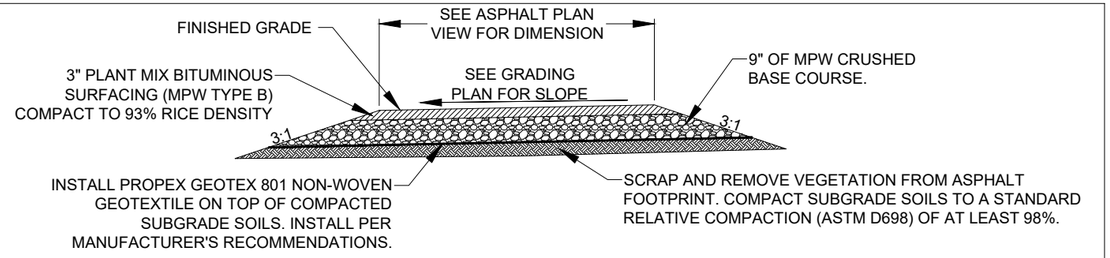
X:\FLATHEAD LAKE BIOLOGICAL STATION - WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\Civil Details\CD-6.dwg SAVED: 9/25/23 PRINTED: 2/7/24 BY: ADAM



Typical Conduit Building Entrance

1

NO SCALE



Asphalt Typical Section

2

C-7

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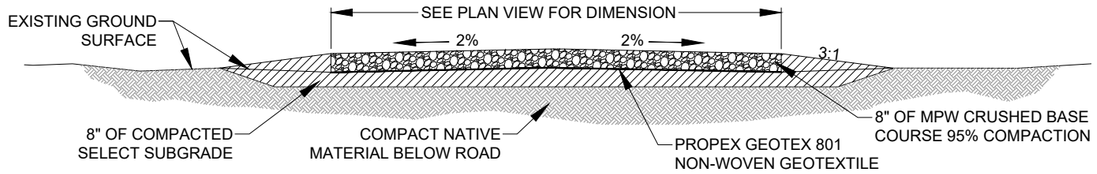

Gravel Road Typical Section

3

C-8

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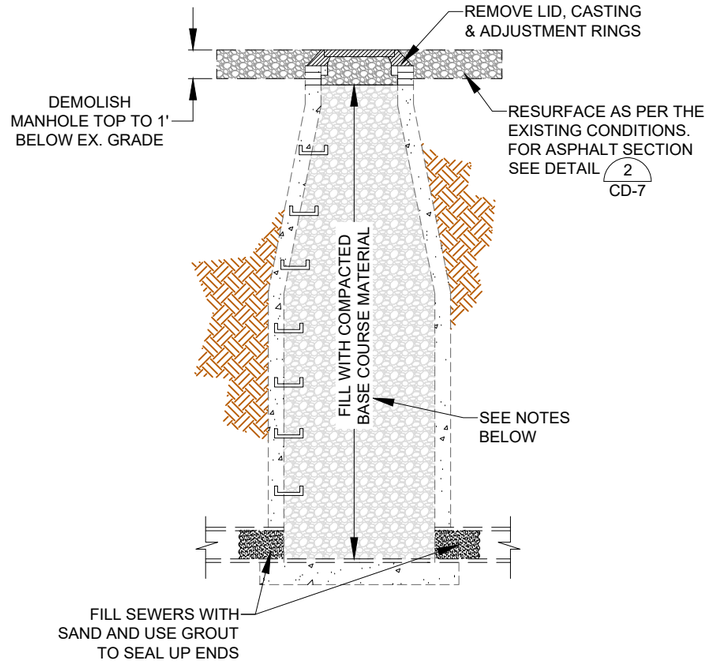


Manhole Abandonment Detail

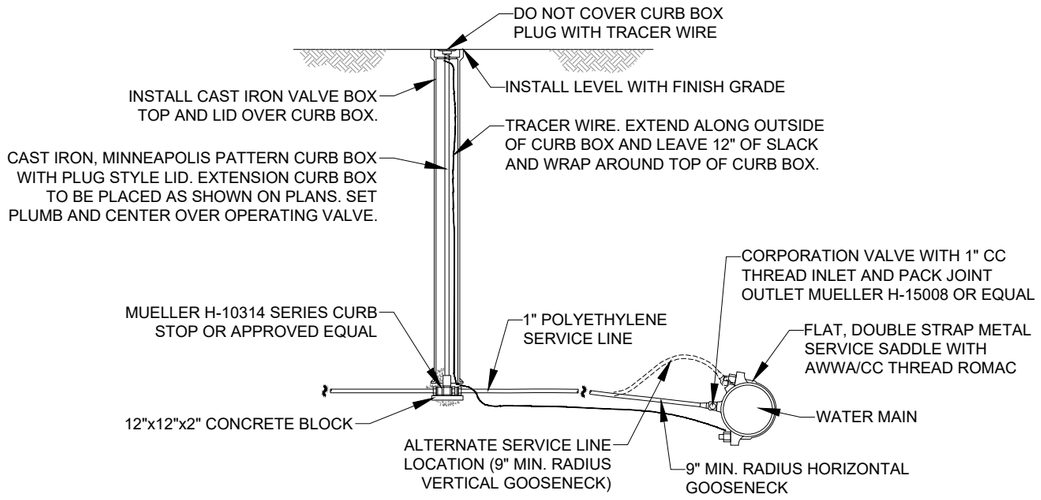
5

C-12

NO SCALE

NOTES:

- EX. MANHOLE #12 TO BE FILLED TO 4' WITH COURSE GRAVEL & TOPPED WITH MPW CRUSHED BASE COURSE MATERIAL.
- ALL ABANDONED SEWERS SHALL BE FILLED WITH SAND (PUMPED). THE ENDS OF THE SEWERS SHALL BE GROUTED SHUT TO RETAIN THE SAND IN THE PIPE.
- ABANDONMENT SHALL BE COORDINATED TO OCCUR AFTER THE NEW PLANT IS OPERATIONAL.



Typical Water Service Detail

4

C-11

NO SCALE

NOTES:

- BEDDING SHALL BE 1" MINUS WITHIN 6" ALL AROUND SERVICE PIPE UNLESS SPECIFIED OTHERWISE.
- CONTRACTOR SHALL PROVIDE THREE (3) 8 FOOT SHUT OFF RODS TO THE OWNER
- MAIN AND SERVICE LINES SHALL HAVE A MINIMUM BURY OF 6 FEET.

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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
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Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

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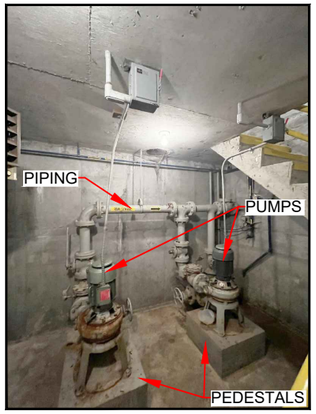
Owner
Flathead Lake Biological Station

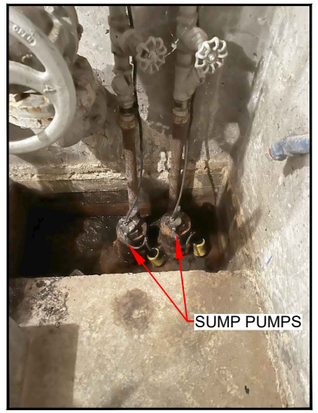
Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Civil Details

Sheet
CD-7

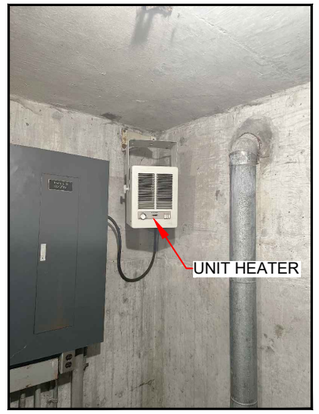


DEMO PHOTO 1 LS-1, LS-2



DEMO PHOTO 2 LS-1, LS-2

DEMO PHOTO 3 LS-1, LS-2



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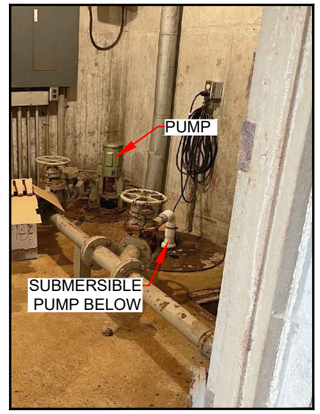
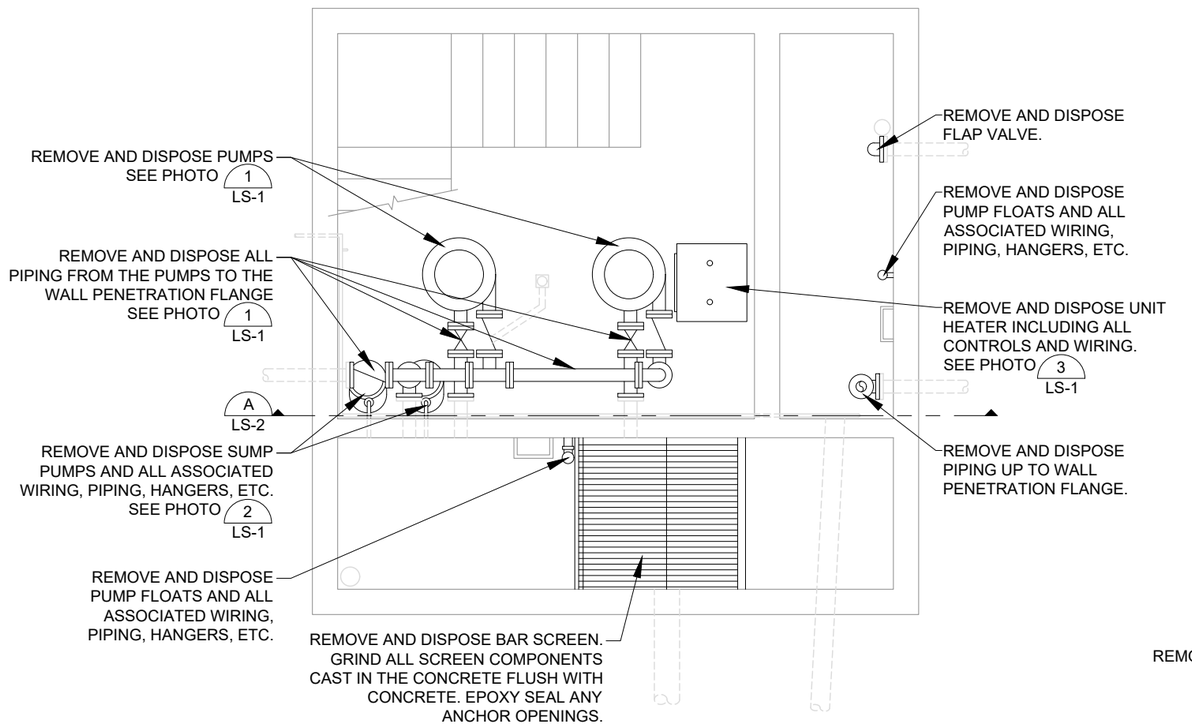


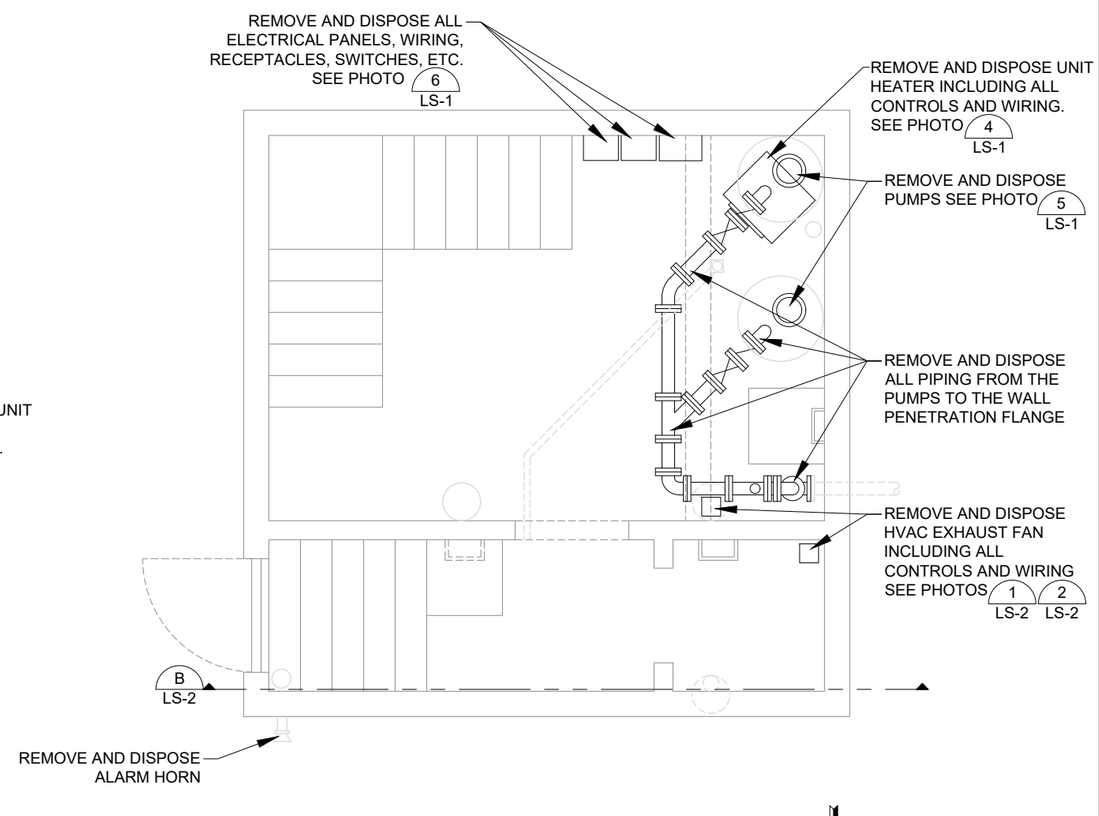
DEMO PHOTO 5 LS-1, LS-2

DEMO PHOTO 6 LS-1, LS-2



Main Lift Station - Lower Level Plan 7 LS-1

SCALE 2 1 0 2 4 Feet



Main Lift Station - Upper Level Plan 8 LS-1

SCALE 2 1 0 2 4 Feet

MONTANA ADAM ECKHART 22032PE LICENSED PROFESSIONAL ENGINEER

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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
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Owner
Flathead Lake Biological Station

Project Title
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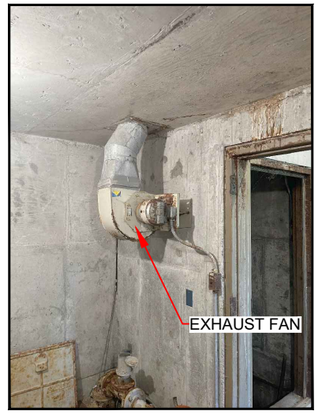
A/E #2016-01-01-02

Sheet Title
Main Lift Station Demolition Plan View

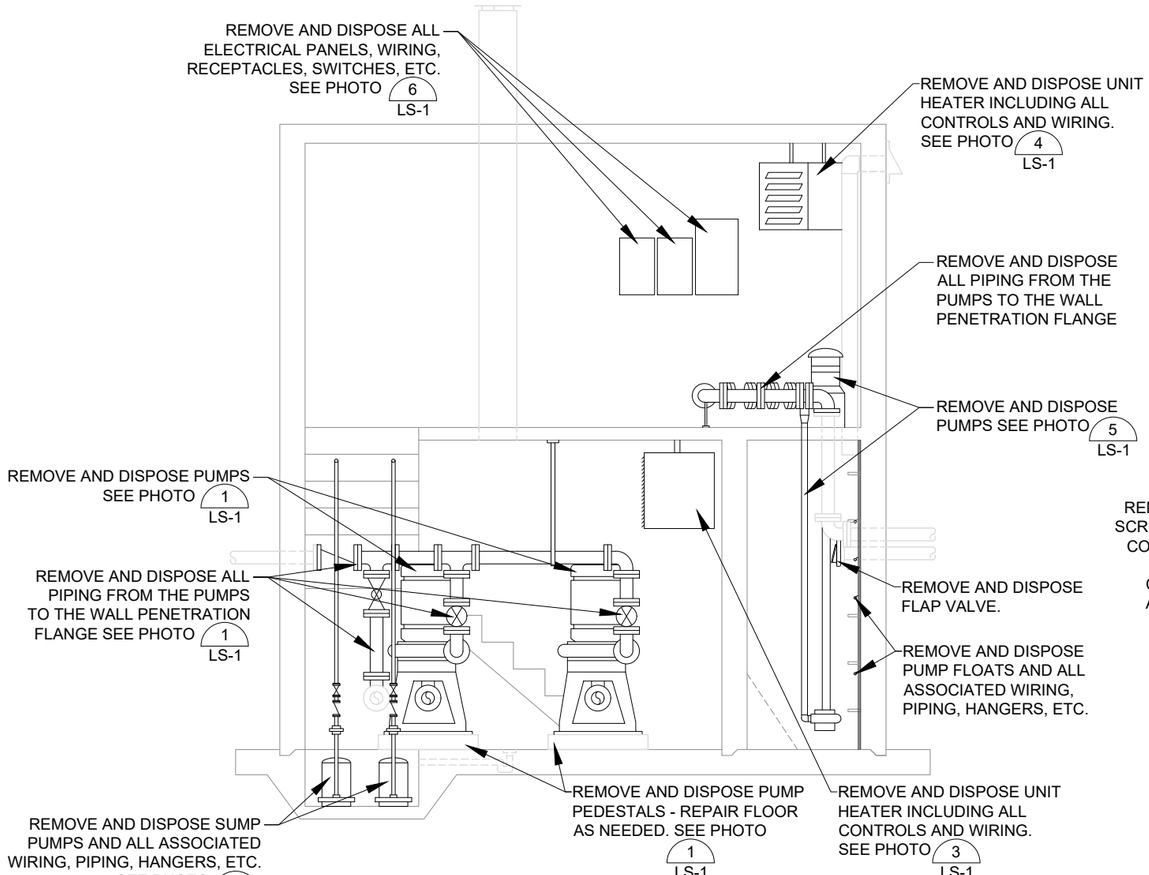
Sheet
LS-1



DEMO PHOTO 1 LS-1

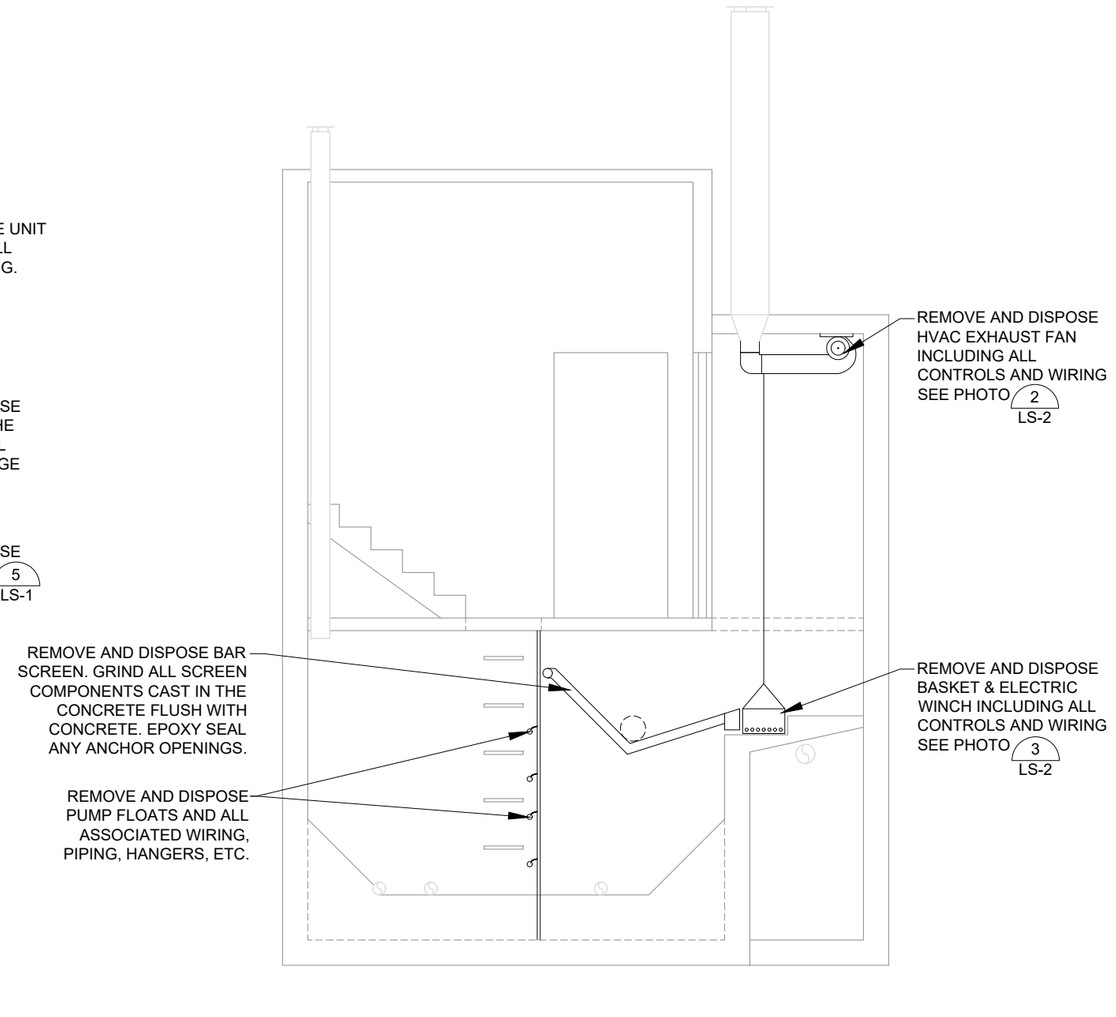
DEMO PHOTO 2 LS-1, LS-2

DEMO PHOTO 3 LS-2



Main Lift Station Section A LS-1

SCALE 2 1 0 2 4 Feet



Main Lift Station Section B LS-1

SCALE 2 1 0 2 4 Feet

MONTANA
ADAM ECKHART
20022PE
LICENSED
PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer

Anderson~Montgomery
CONSULTING ENGINEERS
1064 N. Warren
Helena, Mt 59601
Phone (406) 449-3303
Fax (406) 449-3304

Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Main Lift Station Demolition Section Views**

Sheet: **LS-2**

CALLOUTS:

① - SUBMERSIBLE EFFLUENT PUMPS (TYP. OF 2)
② - DISCHARGE ELBOW (TYP. OF 2) - REMOVE FILLET AS NEEDED TO ACCOMMODATE ELBOW AND DISCHARGE PIPE
③ - 2" SCH. 40 STEEL PIPE GUIDE RAIL (TYP. OF 4)
④ - UPPER GUIDE RAIL BRACKET (TYP. OF 2)
⑤ - NEW MANHOLE LID FOR EFFLUENT PUMPS WITH RUBBER GASKET SEAL AND PICK HOLE PLUGS (TYP. OF 2) NOT SHOWN FOR CLARITY
⑥ - CORE HOLE FOR DISCHARGE PIPE AND SEAL WITH LINKSEAL (TYP. OF 2)
⑦ - HALLIDAY D1S FLOOR STYLE HOIST SOCKET & D1B36 HOIST (HOIST NOT SHOWN FOR DRAWING CLARITY) OR APPROVED EQUAL.
⑧ - 3" DI FL 90° BEND (TYP.)
⑨ - 3" DI PIPE FIELD FIT (TYP.)
⑩ - 3" FLANGED SWING CHECK VALVE (TYP. OF 2)
⑪ - 3" FLANGED PLUG VALVE WITH HANDWHEEL (TYP. OF 2)
⑫ - 3" DI FL 45° BEND
⑬ - 3" DI FL WYE
⑭ - 3" DI PIPE 3" LONG
⑮ - 3" DI PIPE 18" LONG
⑯ - 3" McCROMETER ELECTROMAGNETIC FLOW METER - MOUNT READOUT ON WALL ABOVE HATCH
⑰ - CONNECT NEW 3" DI DISCHARGE PIPE TO EXISTING DISCHARGE PIPE
⑱ - INTRINSICALLY SAFE SUBMERSIBLE TRANSDUCER AND CABLE - HANG FROM 5/8" STAINLESS STEEL EYEBOLT (TYP. OF 2)
⑲ - 2" SCH. 80 PVC STILLING WELL AFFIXED TO SIDE OF WETWELL WITH TWO 2" HEAVY DUTY STAINLESS STEEL PIPE STRAPS WITH 3"x3/8" CONCRETE ANCHOR BOLTS. (TYP. OF 2)
⑳ - BACKUP FLOATS - PUMP OFF, LEAD PUMP ON, LAG PUMP ON AND HIGH WATER ALARM (TYP. OF 2)
㉑ - REZNOR 4 KW ELECTRIC HEATER MODEL EGHB - MOUNT VERTICALLY AND POINT THE DIRECTIONAL FINS DOWN THE STAIRWELL
㉒ - GREENHECK USF-08 CW-UB EXHAUST FAN WITH DAMPER - CONNECT TO EXISTING HVAC DUCT
㉓ - GREENHECK USF-06 CW-TH EXHAUST FAN WITH DAMPER - CONNECT TO EXISTING HVAC DUCT
㉔ - GREENHECK CUE-099-C EXHAUST FAN WITH DAMPER - CORE SQUARE HOLE IN WALL FOR FAN
㉕ - CORE HOLE IN FLOOR INTO RAW WETWELL FOR 6" STEEL HVAC PIPE - SEAL PIPE IN FLOOR WITH GROUT & PROVIDE PIPE SUPPORTS AS NEEDED. CONNECT HVAC PIPE TO NEW EXHAUST FAN
㉖ - CLEAN AND SANDBLAST EXISTING CASTINGS. APPLY HIGH PERFORMANCE COATING WHERE THE LID INTERFACES THE CASTING AS PER ENGINEERS DISCRETION. THE TOPS OF THE CASTING THAT ARE FLUSH WITH THE F.F. SHALL HAVE A SAFETY YELLOW HIGH PERFORMANCE COATING APPLIED. (TYP. OF 4)
㉗ - CLEAN AND SANDBLAST ALL STAIR TREAD NOSE GUARDS & HANDRAILS. APPLY SAFETY YELLOW HIGH PERFORMANCE COATING.
㉘ - NEW NEENAH FOUNDRY R-6660 GASKETED LID WITH BOLTS (TYP. OF 2). LIDS **SHALL** BE AIRTIGHT TO PREVENT GASSES FROM ENTERING THE INTERIOR BUILDING SPACE.

CALLOUTS CONTINUED:

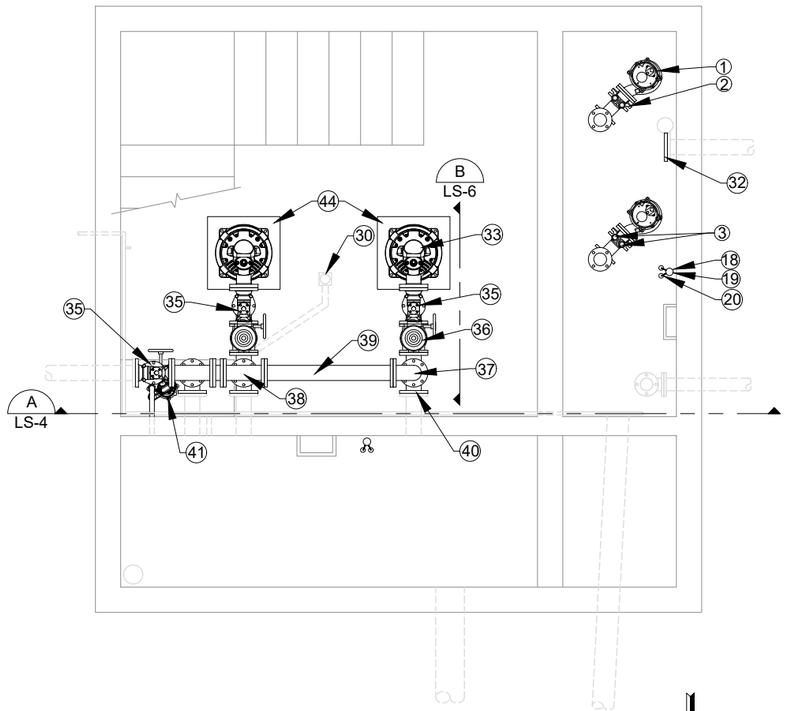
㉙ - CLEAN AND SANDBLAST ALL DOOR FRAMES. APPLY GRAY HIGH PERFORMANCE COATING
㉚ - INSTALL RECTORSEAL SURE SEAL WATERLESS DRAIN TRAP SEAL (TYP. OF 2)
㉛ - PIPE STANDS (TYP.) SEE DETAIL 1/CD-4
㉜ - INSTALL 4" BLIND FLANGE
㉝ - RAW SOLIDS HANDLING PUMPS (TYP. OF 2)
㉞ - DRY PIT SUCTION ELBOW (TYP. OF 2)
㉟ - 4" FLANGED RUBBER FLAPPER SWING CHECK VALVE (TYP. OF 3)
㊱ - 4" FLANGED PLUG VALVE (TYP. OF 5)
㊲ - 4" DI FL 90° BEND (TYP.)
㊳ - 4" DI FL TEE (TYP.)
㊴ - 4" DI PIPE FIELD FIT (TYP.)
㊵ - CONNECT NEW 4" DI PIPE TO EXISTING PIPE (TYP. OF 4)
㊶ - NEW SUMP PUMP, SHUT OFF VALVE, 2 CHECK VALVES, PIPING (SCH. 40 PVC), & CONNECTION TO EXISTING WET WELL PENETRATION
㊷ - NEW PUMP CONTROLLER (ONE PANEL FOR BOTH THE RAW & EFFLUENT PUMPS)
㊸ - NEW ALARM STROBE & HORN
㊹ - NEW CONCRETE PUMP PEDESTALS
㊺ - STRUCTURAL OR FLOWABLE FILL
㊻ - NEW 6" THICK VERTICAL CONCRETE WALL & 4" THICK CONCRETE FLOOR - SEE DETAIL 1/LS-6
㊼ - CAP EXISTING SUMP PUMP PENETRATION

NOTES:

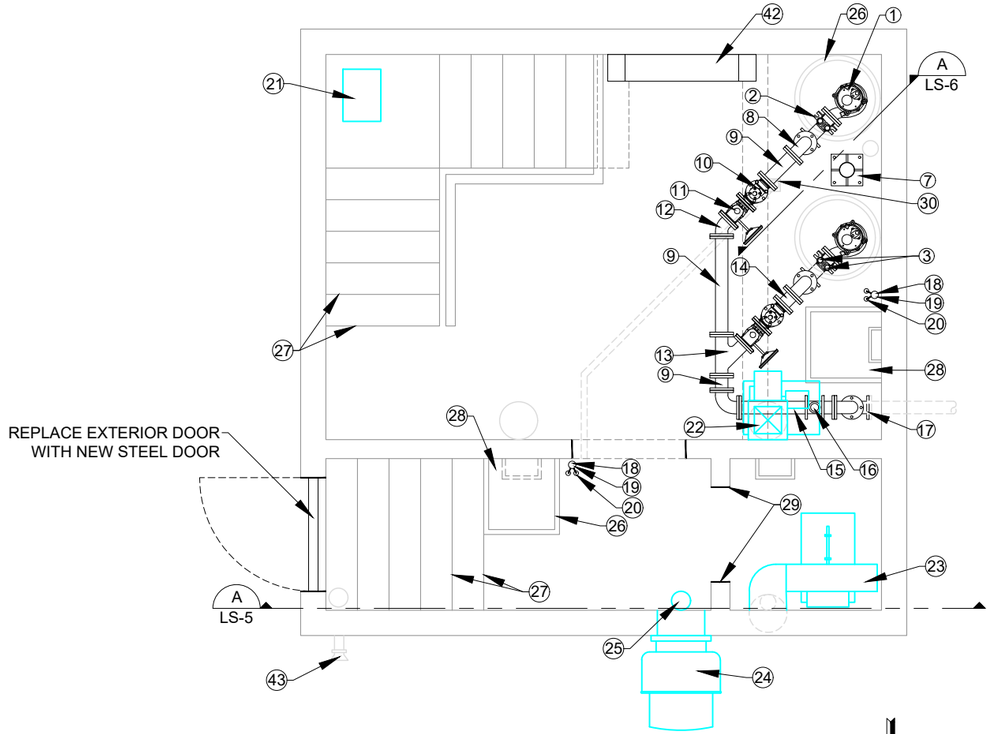
- RUN PUMP POWER CABLES IN ONE CONDUIT AND TRANSDUCER CABLES IN THE OTHER CONDUIT.
- HOIST SOCKET SHALL BE LOCATED EXACTLY BETWEEN THE EFFLUENT PUMPS TO ALLOW FOR REMOVAL.
- INSTALL PIPE HANGERS AS NEEDED FOR RAW PUMP PIPING

EFFLUENT PUMP ELEVATIONS:
2897.75 - HIGH LEVEL ALARM
2897.25 - LAG PUMP ON
2896.25 - LEAD PUMP ON
2894.25 - PUMP OFF

RAW PUMP ELEVATIONS:
2896.76 - HIGH LEVEL ALARM
2896.26 - LAG PUMP ON
2895.51 - LEAD PUMP ON
2893.51 - PUMP OFF



Main Lift Station - Lower Level Plan 1/LS-3
SCALE 2 1 0 2 4 Feet
N



Main Lift Station - Upper Level Plan 2/LS-3
SCALE 2 1 0 2 4 Feet
N

MONTANA ADAM ECKHART 22022PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
Anderson~Montgomery CONSULTING ENGINEERS
1064 N. Warren
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Phone (406) 449-3303
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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Main Lift Station Plan Views

Sheet
LS-3

CALLOUTS:

① - SUBMERSIBLE EFFLUENT PUMPS (TYP. OF 2)
② - DISCHARGE ELBOW (TYP. OF 2) - REMOVE FILLET AS NEEDED TO ACCOMMODATE ELBOW AND DISCHARGE PIPE
③ - 2" SCH. 40 STEEL PIPE GUIDE RAIL (TYP. OF 4)
④ - UPPER GUIDE RAIL BRACKET (TYP. OF 2)
⑤ - NEW MANHOLE LID FOR EFFLUENT PUMPS WITH RUBBER GASKET SEAL AND PICK HOLE PLUGS (TYP. OF 2) NOT SHOWN FOR CLARITY
⑥ - CORE HOLE FOR DISCHARGE PIPE AND SEAL WITH LINKSEAL (TYP. OF 2)
⑦ - HALLIDAY D1S FLOOR STYLE HOIST SOCKET & D1B36 HOIST (HOIST NOT SHOWN FOR DRAWING CLARITY) OR APPROVED EQUAL.
⑧ - 3" DI FL 90° BEND (TYP.)
⑨ - 3" DI PIPE FIELD FIT (TYP.)
⑩ - 3" FLANGED SWING CHECK VALVE (TYP. OF 2)
⑪ - 3" FLANGED PLUG VALVE WITH HANDWHEEL (TYP. OF 2)
⑫ - 3" DI FL 45° BEND
⑬ - 3" DI FL WYE
⑭ - 3" DI PIPE 3" LONG
⑮ - 3" DI PIPE 18" LONG
⑯ - 3" McCROMETER ELECTROMAGNETIC FLOW METER - MOUNT READOUT ON WALL ABOVE HATCH
⑰ - CONNECT NEW 3" DI DISCHARGE PIPE TO EXISTING DISCHARGE PIPE
⑱ - INTRINSICALLY SAFE SUBMERSIBLE TRANSDUCER AND CABLE - HANG FROM 5/8" STAINLESS STEEL EYEBOLT (TYP. OF 2)
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㉑ - REZNOR 4 KW ELECTRIC HEATER MODEL EGHB - MOUNT VERTICALLY AND POINT THE DIRECTIONAL FINS DOWN THE STAIRWELL
㉒ - GREENHECK USF-08 CW-UB EXHAUST FAN WITH DAMPER - CONNECT TO EXISTING HVAC DUCT
㉓ - GREENHECK USF-06 CW-TH EXHAUST FAN WITH DAMPER - CONNECT TO EXISTING HVAC DUCT
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㉖ - CLEAN AND SANDBLAST EXISTING CASTINGS. APPLY HIGH PERFORMANCE COATING WHERE THE LID INTERFACES THE CASTING AS PER ENGINEERS DISCRETION. THE TOPS OF THE CASTING THAT ARE FLUSH WITH THE F.F. SHALL HAVE A SAFETY YELLOW HIGH PERFORMANCE COATING APPLIED. (TYP. OF 4)
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㉜ - INSTALL 4" BLIND FLANGE
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㉟ - 4" FLANGED RUBBER FLAPPER SWING CHECK VALVE (TYP. OF 3)
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㊲ - 4" DI FL 90° BEND (TYP.)
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㊵ - CONNECT NEW 4" DI PIPE TO EXISTING PIPE (TYP. OF 4)
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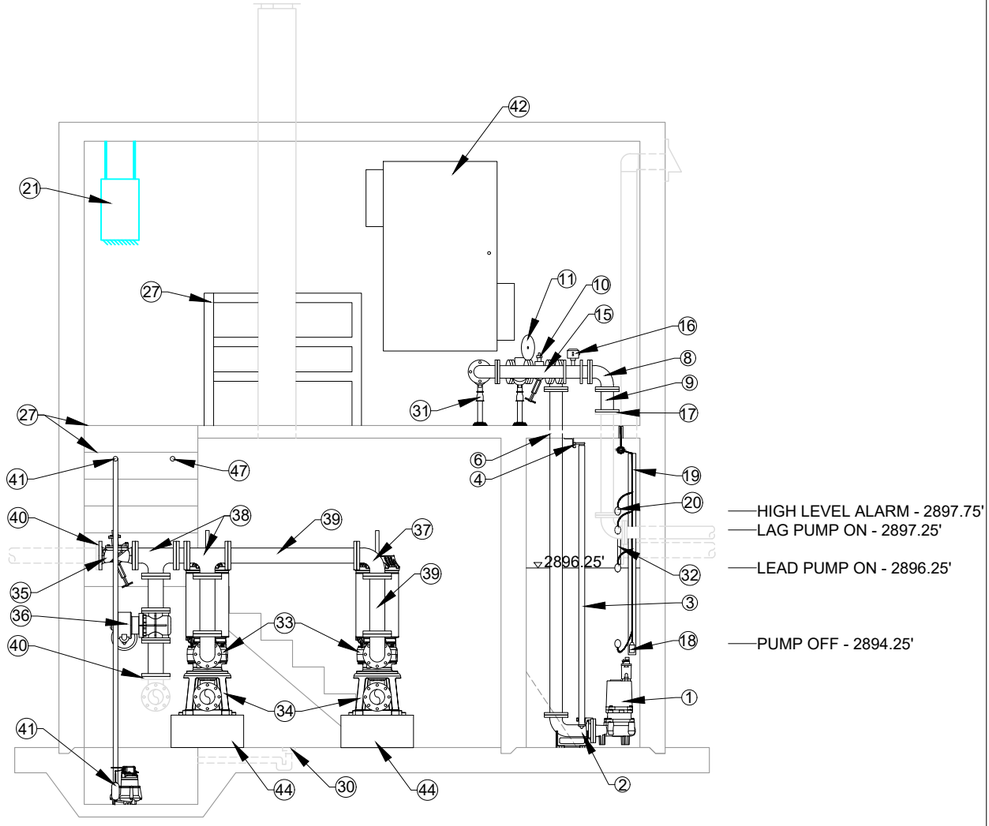
㊻ - NEW 6" THICK VERTICAL CONCRETE WALL & 4" THICK CONCRETE FLOOR - SEE DETAIL 1/LS-6
㊼ - CAP EXISTING SUMP PUMP PENETRATION

NOTES:

- RUN PUMP POWER CABLES IN ONE CONDUIT AND TRANSDUCER CABLES IN THE OTHER CONDUIT.
- HOIST SOCKET SHALL BE LOCATED EXACTLY BETWEEN THE EFFLUENT PUMPS TO ALLOW FOR REMOVAL.
- INSTALL PIPE HANGERS AS NEEDED FOR RAW PUMP PIPING

EFFLUENT PUMP ELEVATIONS:
2897.75 - HIGH LEVEL ALARM
2897.25 - LAG PUMP ON
2896.25 - LEAD PUMP ON
2894.25 - PUMP OFF

RAW PUMP ELEVATIONS:
2896.76 - HIGH LEVEL ALARM
2896.26 - LAG PUMP ON
2895.51 - LEAD PUMP ON
2893.51 - PUMP OFF



Main Lift Station Section A/LS-3

SCALE 2 1 0 2 4 Feet

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MONTANA ADAM ECKHART 20029PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
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1064 N. Warren
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Phone (406) 449-3303
Fax (406) 449-3304

Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Main Lift Station Section View

Sheet
LS-4

CALLOUTS:

① - SUBMERSIBLE EFFLUENT PUMPS (TYP. OF 2)
② - DISCHARGE ELBOW (TYP. OF 2) - REMOVE FILLET AS NEEDED TO ACCOMMODATE ELBOW AND DISCHARGE PIPE
③ - 2" SCH. 40 STEEL PIPE GUIDE RAIL (TYP. OF 4)
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⑬ - 3" DI FL WYE
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⑳ - BACKUP FLOATS - PUMP OFF, LEAD PUMP ON, LAG PUMP ON AND HIGH WATER ALARM (TYP. OF 2)
㉑ - REZNOR 4 KW ELECTRIC HEATER MODEL EGHB - MOUNT VERTICALLY AND POINT THE DIRECTIONAL FINS DOWN THE STAIRWELL
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㉜ - INSTALL 4" BLIND FLANGE
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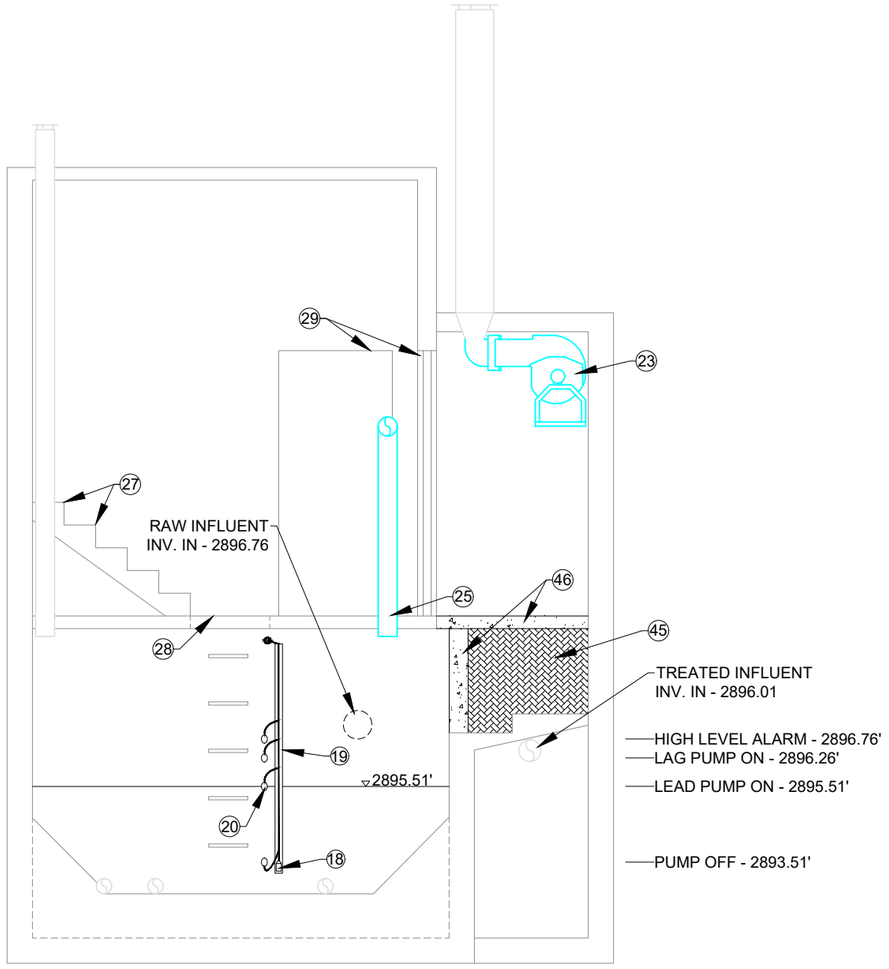
㊻ - NEW 6" THICK VERTICAL CONCRETE WALL & 4" THICK CONCRETE FLOOR - SEE DETAIL 1/LS-6
㊼ - CAP EXISTING SUMP PUMP PENTRATION

NOTES:

- RUN PUMP POWER CABLES IN ONE CONDUIT AND TRANSDUCER CABLES IN THE OTHER CONDUIT.
- HOIST SOCKET SHALL BE LOCATED EXACTLY BETWEEN THE EFFLUENT PUMPS TO ALLOW FOR REMOVAL.
- INSTALL PIPE HANGERS AS NEEDED FOR RAW PUMP PIPING

EFFLUENT PUMP ELEVATIONS:
2897.75 - HIGH LEVEL ALARM
2897.25 - LAG PUMP ON
2896.25 - LEAD PUMP ON
2894.25 - PUMP OFF

RAW PUMP ELEVATIONS:
2896.76 - HIGH LEVEL ALARM
2896.26 - LAG PUMP ON
2895.51 - LEAD PUMP ON
2893.51 - PUMP OFF



Main Lift Station Section A/LS-3

SCALE 2 1 0 2 4 Feet

MONTANA ADAM ECKHART 20029PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
Final	2-5-24	AE

Revision: Final
Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
Approved By: A.Eckhart, P.E.
Checked By: P.Montgomery, P.E.
Designed By: A.Eckhart, P.E.

Engineer
Anderson~Montgomery CONSULTING ENGINEERS
1064 N. Warren
Helena, Mt 59601
Phone (406) 449-3303
Fax (406) 449-3304

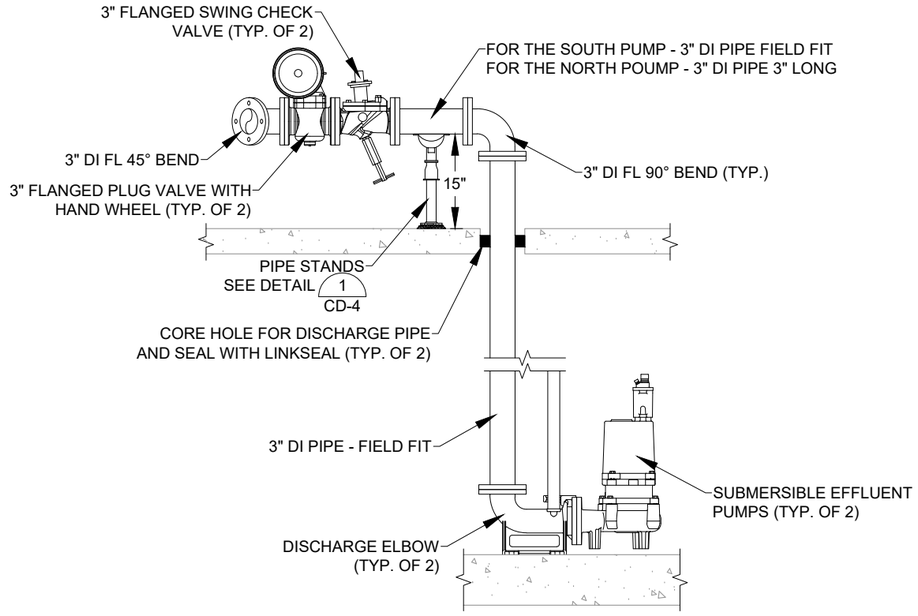
Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Main Lift Station Section View

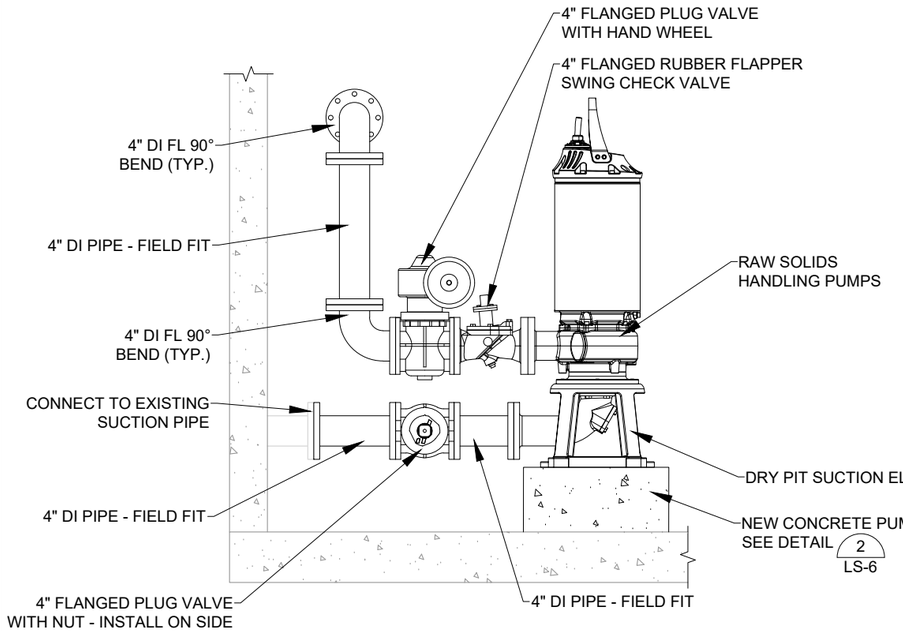
Sheet
LS-5

X:\FLATHEAD LAKE BIOLOGICAL STATION - WASTEWATER TREATMENT\DESIGN\DRAWINGS\Sheets\Lift Station\LS-3, LS-4, LS-5 & LS-6.dwg SAVED: 9/26/23 PRINTED: 2/7/24 BY: ADAM



Effluent Pumps Section (A, LS-3)

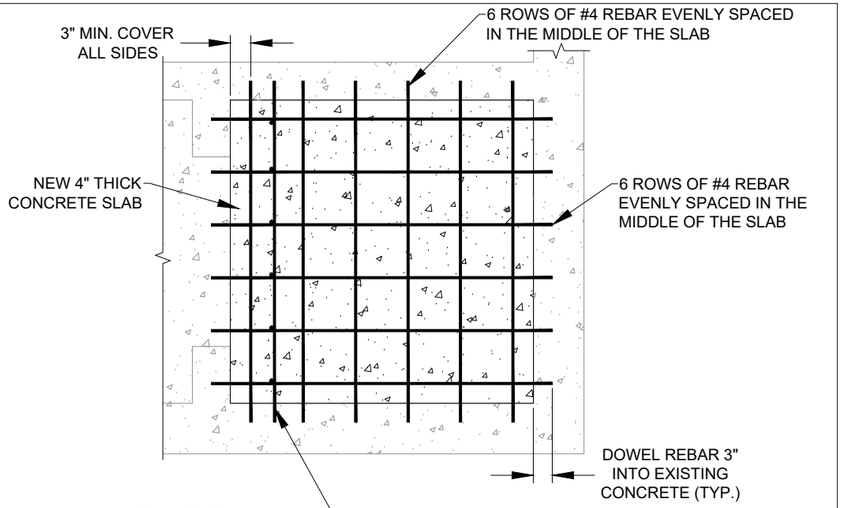
SCALE 1 0.5 0 1 2 Feet



Raw Pumps Section (B, LS-3)

SCALE 1 0.5 0 1 2 Feet

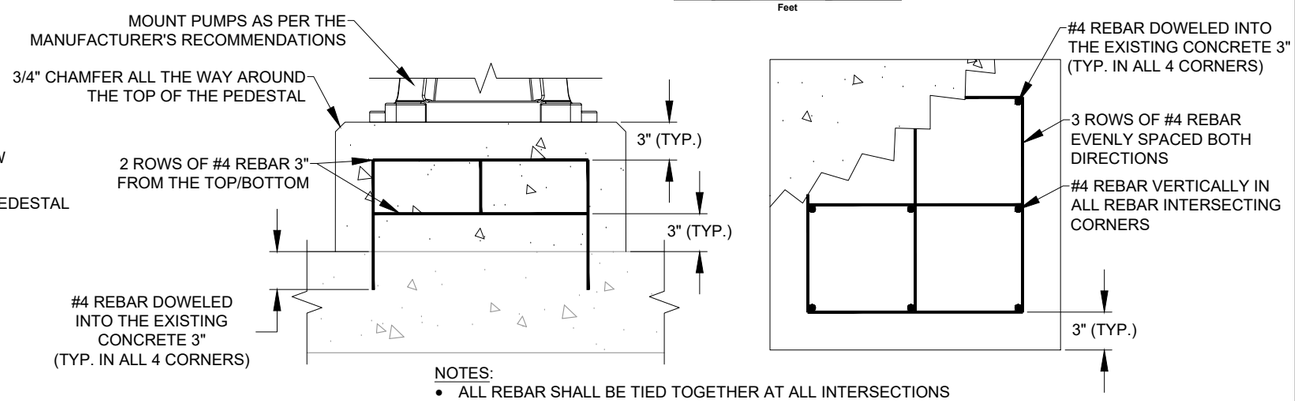
NOTE:
- CONTRACTOR TO SUPPLY OWNER WITH TWO 1' LONG VALVE KEY WITH A 12" DIAMETER HANDWHEEL FOR OPERATING THE PLUG VALVES INSTALLED ON THEIR SIDE WITH A NUT.



NOTES:
- ALL REBAR SHALL BE TIED TOGETHER AT ALL INTERSECTIONS
- STRUCTURAL FILL SHALL BE COMPACTED TO A RELATIVE COMPACTION OF AT LEAST 95%

New Concrete Wall & Floor Detail (1, LS-5)

SCALE 1 0.5 0 1 2 Feet



NOTES:
- ALL REBAR SHALL BE TIED TOGETHER AT ALL INTERSECTIONS

Raw Pumps Pedestal Detail (2, LS-6)

SCALE 0.5 0.25 0 0.5 1 Feet

MONTANA ADAM ECKHART 50329PE LICENSED PROFESSIONAL ENGINEER

Revision	Date	By
Draft	8-7-23	AE
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Plot Scale: 1:2
Drawn By: A.Eckhart, P.E.
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Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Main Lift Station Details**

Sheet: **LS-6**

ELECTRICAL SYMBOLS LEGEND

LIGHTING

- LINEAR STRIP
- SURFACE-MOUNT LIGHT
- RECESSED LIGHT
- RECESSED EMERGENCY LIGHT
- RECESSED CAN LIGHT
- RECESSED EMERGENCY CAN LIGHT
- PENDANT LIGHT
- WALL MOUNTED SCONCE
- BOLLARD LIGHT
- POLE-MOUNTED LIGHT, SINGLE HEAD
- POLE-MOUNTED LIGHT, DOUBLE HEAD
- WALLPACK
- EXIT LIGHT W/ DIRECTIONAL ARROW
- WALL-MOUNT EMERGENCY FLOODLIGHT
- EXHAUST FAN
- EXHAUST FAN WITH LIGHT FIXTURE
- PHOTOCELL

RECEPTACLES

- DUPLEX RECEPTACLE
- DUPLEX RECEPTACLE, ISOLATED GND
- FOURPLEX RECEPTACLE
- DUPLEX RECEPTACLE, FLOOR MOUNTED
- SPECIALTY RECEPTACLE, SEE NOTES

SWITCHES

- SINGLE POLE SWITCH
- TWO CIRCUIT SWITCH
- THREE CIRCUIT SWITCH
- DOUBLE POLE SWITCH
- THREE-WAY SWITCH
- FOUR-WAY SWITCH
- KEY OPERATED SWITCH
- SWITCH WITH TIMER
- MOTION CONTROLLED SWITCH
- DIMMER SWITCH
- DEHUMIDITY SWITCH
- DIGITAL LIGHTING SWITCH

SECURITY/INTERCOM

- RECESSED DOOR CONTACT
- KEYPAD
- EMERGENCY PANEL
- SPEAKER
- PUSHBUTTON STATION
- PUSHBUTTON STATION W/ SPEAKER
- VOLUME CONTROL
- WATER LEVEL DETECTOR

CIRCUITING

- HOMERUN TO PANEL A, CKT 1. ARROWHEADS INDICATE # OF CIRCUITS. HASH MARKS INDICATE # OF CONDUCTORS.
- | = NEUTRAL; I = HOT; τ = ISOLATED GND; ⊨ RETURN
- CONDUIT TURNED UP
- CONDUIT TURNED DOWN
- UNDERGROUND CONDUIT
- CONDUIT HIDDEN IN WALLS/CEILING
- PANEL BOARD
- CIRCUIT BREAKER
- UTILITY METER
- UTILITY POLE
- ELECTRICAL JUNCTION BOX
- GENERATOR
- AUTOMATIC TRANSFER SWITCH
- TRANSFORMER
- GROUND ROD

LOW VOLTAGE

- GROUND
- TIME CLOCK
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- RELAY SWITCH

PUMPS/MOTORS

- PUMP
- MOTOR
- VARIABLE SPEED PUMP
- PUMP CONTROL PANEL
- EQUIPMENT DISCONNECT
- MAGNETIC MOTOR STARTER
- MAGNETIC MOTOR STARTER WITH DISCONNECT
- 20A, 3 POLE, DUEL ELEMENT FUSE WITH DISCONNECT
- FUSE
- FUSE WITH DISCONNECT
- THERMOSTAT

PHONE/DATA

- TELEPHONE PORT
- DATA PORT
- DATA/PHONE PORT
- DATA/PHONE PORT, FLOOR MOUNTED
- DATA/PHONE JUNCTION BOX
- TELEPHONE TERMINAL BOARD

FIRE ALARM SYSTEM

- SMOKE DETECTOR
- HEAT DETECTOR
- MAGNETIC DOOR HOLD

GENERAL ELECTRICAL NOTES

CONTRACTOR SHALL INCREASE CONDUIT AND CONDUCTOR SIZE TO ALLOW FOR A 3% MAXIMUM VOLTAGE DROP WHERE NECESSARY. SHOULD THE CONTRACTOR EXCEED THE SPECIFIC ROUTING INDICATED ON THE PLANS, THEN THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING PRIOR TO ANY DEVIATION FROM THE PLANS.

ALL WORK SHALL COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE THAT HAS BEEN ADOPTED BY THE STATE OF MONTANA.

ALL CONDUCTORS SHALL BE TYPE THHN, UNLESS NOTED OTHERWISE.

RECEPTACLES SHALL BE NEMA 5-20R.

PRIOR TO BID, ROUGH-IN, AND INSTALLATION, THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND REQUIREMENTS OF ALL ELECTRICAL ITEMS.

CONTRACTOR SHALL FURNISH ALL LABOR AND MATERIALS AND PERFORM ALL OPERATIONS NECESSARY FOR THE INSTALLATION OF COMPLETE AND OPERATING ELECTRICAL SYSTEMS SUBJECT TO THE CONDITIONS OF THE CONTRACT.

PROVIDE SATISFACTORY OPERATION OF ALL EQUIPMENT AND CONTROLS TO THE ENGINEER UPON REQUEST.

CONTRACTOR IS RECOMMENDED TO VISIT THE PREMISES BEFORE SUBMITTING BID, AS NO EXTRAS WILL BE ALLOWED FOR LACK OF KNOWLEDGE OF EXISTING CONDITIONS.

ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND BECAUSE OF THE SMALL SCALE, IT IS NOT POSSIBLE TO INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. VERIFY ALL SPACE REQUIREMENTS, COORDINATING WITH OTHER TRADES, AND INSTALL THE SYSTEMS IN THE SPACE PROVIDED WITHOUT EXTRA CHARGES TO THE OWNER.

CONTRACTOR SHALL PERFORM WORK IN ACCORDANCE WITH GOOD COMMERCIAL PRACTICE. THE GOOD APPEARANCE OF THE FINISHED WORK SHALL BE OF EQUAL IMPORTANCE WITH ITS ELECTRICAL EFFICIENCY THE ENGINEER MAY REJECT WORK IF WORKMANSHIP AND APPEARANCE ARE NOT SATISFACTORY. INSTALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH THE MANUFACTURERS' RECOMMENDATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE, OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.

CONTRACTOR SHALL APPLY FOR AND PAY FOR ALL PERMITS, FEES, LICENSES AND INSPECTIONS FOR THIS DIVISION OF WORK. COMPLY WITH STATE AND LOCAL CODE REQUIREMENTS AND ORDINANCES. COMPLY WITH REQUIREMENTS OF THE UTILITY COMPANIES. IN THE CASE OF DIFFERENCES BETWEEN THESE REQUIREMENTS AND ORDINANCES, THE MOST STRINGENT SHALL GOVERN. CALL FOR INSPECTIONS REQUIRED BY LOCAL BUILDING INSPECTION AUTHORITY.

PLANS AND SPECIFICATIONS GO HAND IN HAND. WHAT IS REQUIRED IN ONE IS REQUIRED IN BOTH. WHERE CONFLICTS BETWEEN SPECIFICATIONS AND PLANS EXIST, THE MOST STRINGENT REQUIREMENTS SHALL APPLY.

CONTRACTOR SHALL, AT COMPLETION OF WORK, DELIVER COMPLETED PROJECT RECORD DOCUMENTS MARKED WITH FIELD CHANGES TO ENGINEER.

CONTRACTOR SHALL PROVIDE A WRITTEN WARRANTY TO THE OWNER COVERING THE ENTIRE ELECTRICAL WORK TO BE FREE FROM DEFECTIVE MATERIALS, EQUIPMENT AND WORKMANSHIP FOR A PERIOD OF (ONE) YEAR AFTER DATE OF ACCEPTANCE.

CONTRACTOR SHALL CLEAN EXPOSED SURFACES OF LIGHT FIXTURES, SWITCHGEAR AND OTHER EXPOSED ITEMS OF GREASE, DIRT OR OTHER FOREIGN MATERIAL. REMOVE RUBBISH AND DEBRIS RESULTING FROM THE OPERATIONS AND LEAVE EQUIPMENT SPACES CLEAN AND READY FOR USE.

CONTRACTOR SHALL MAINTAIN ALL CEILING, FLOOR AND WALL FIRE AND SMOKE PROTECTION RATINGS. SEAL ALL CONDUIT AND ENCLOSURE PENETRATIONS TO COMPLY WITH UL ASSEMBLY AND BUILDING CODE REQUIREMENTS. ALL SEALANTS AND CONSTRUCTIONS SHALL BE APPROVED BY ENGINEER PRIOR TO APPLICATION. ALL OPENINGS SHALL BE SEALED DAILY.

CONTRACT DRAWINGS FOR ELECTRICAL WORK ARE IN PART DIAGRAMMATIC, INTENDED TO CONVEY THE SCOPE OF WORK AND INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, CONDUITS, AND APPROXIMATE SIZES AND LOCATIONS OF EQUIPMENT AND OUTLETS. ELECTRICAL TRADES SHALL FOLLOW THESE DRAWINGS IN LAYING OUT THEIR WORK, CONSULT GENERAL CONSTRUCTION DRAWINGS TO FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THEIR WORK, AND SHALL VERIFY SPACES IN WHICH THEIR WORK WILL BE INSTALLED. COORDINATE WORK WITH OTHER TRADES AS JOB CONDITIONS REASONABLY REQUIRE.

NO MORE THAN ONE OF EACH PHASE CONDUCTOR, ONE NEUTRAL, TWO TRAVELERS, TWO SWITCH LEGS, AND GROUNDING CONDUCTORS SHALL BE INSTALLED IN A SINGLE RACEWAY UNLESS PRIOR APPROVAL IS OBTAINED FROM THE ENGINEER. CONDUIT FILL SHALL NOT EXCEED 40%.

ALL RACEWAYS SHALL BE SURFACE-MOUNTED, EXPOSED ON EXISTING WALLS AND GYP BOARD CEILINGS. ALL EXPOSED RACEWAYS SHALL BE ROUTED PLUMB AND SQUARE TO BUILDING SURFACES.

LIGHTING NOTES:

COORDINATING THE PROPER TYPES OF TRIMS TO FIT THE RECESSED FIXTURES IN THE CEILING TYPE INDICATED BY THE ENGINEER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

ALL LIGHT FIXTURE COLORS AND FINISHES SHALL BE COORDINATED BETWEEN THE CONTRACTOR AND THE ENGINEER.

ALL LAMPS NOT SPECIFIED IN THE LIGHTING FIXTURE SCHEDULE SHALL BE OF LED TYPE. ALL DRIVERS NOT SPECIFIED IN THE LIGHTING FIXTURE SCHEDULE SHALL BE DIMMABLE.

REFER TO LIGHTING FIXTURE SCHEDULE FOR LIGHTING DESCRIPTION, MFG, AND PART NUMBER.

CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLYING MOUNTING BRACKETS TO FIT CEILING CONDITIONS.

FIXTURES IN CONTACT WITH INSULATION SHALL HAVE A U.L. LISTED THERMAL BARRIER.

RACEWAYS: RACEWAYS SHALL BE CONCEALED AND APPROVED FOR USE AND LOCATION.
- DRY LOCATIONS - GRC, IMC, EMT.
- UNDERGROUND - GRC, PVC
- FLEXIBLE CONDUIT - GALVANIZED, LIQUID TIGHT STEEL.

JUNCTION AND PULL BOXES:
- DRY LOCATIONS - STEEL WITH COVERS.
- WET LOCATIONS - CAST ALUMINUM.
- SIZE PER NEC.

COUPLINGS AND CONNECTORS:
- GRC - THREADED
- IMC - THREADED
- EMT - COMPRESSION OR SET SCREW, BOTH OF STEEL
- PVC - CEMENT JOINT TYPE
- INDENTER TYPE CONNECTORS PROHIBITED.

WIRING DEVICES AND PLATES:
- DUPLEX OUTLETS - INDUSTRIAL GRADE, 20 AMP, 5-20R (HUBBELL #HBL5362 OR LEVITON #5362)
- GFCI OUTLETS - COMMERCIAL GRADE, 20 AMP, 5-20R (HUBBELL #HBLGF5362 OR LEVITON #7899)
- AC SWITCHES GENERAL - INDUSTRIAL GRADE, 20 AMP (HUBBELL #HBL1221 OR LEVITON #1221-2)
- EXPLOSION PROOF OUTLETS: 20 AMP, 125VAC (APPLETON #EFSC175-2023)
- EXPLOSION PROOF SWITCHES: 20 AMP, 125VAC (APPLETON #EDSC175-F1/F3W)
- DEVICE COLOR - STAINLESS STEEL
- PLATES - STAINLESS STEEL

WIRE: COPPER ONLY WITH THHN/THWN TYPE INSTALLATION. NO ALUMINUM CONDUCTORS ALLOWED. UL LISTED LUGS AND CONNECTORS. ALL COLOR-CODING SHALL BE NEC APPROVED. ALL WIRE SIZES BASED ON 75 DEGREE C TERMINALS.

GROUNDING: IN STRICT ACCORDANCE WITH THE NEC, UTILITY AND TELEPHONE COMPANY REGULATIONS. PROVIDE COPPER EQUIPMENT GROUNDING CONDUCTOR IN ALL RACEWAYS.

SUPPORTS AND HANGERS: SUPPORTS AND HANGERS MUST BE UL LISTED AND APPROVED BY LOCAL INSPECTORS.

ANCHORS:
- HOLLOW MASONRY - TOGGLE BOLT
- SOLID MASONRY - EXPANSION BOLT
- METAL - MACHINE SCREWS, BOLTS, WELDING
- WOOD - WOOD SCREWS

NAME PLATES: PROVIDE ON ALL PANELS, DISCONNECTS: 3/16" HIGH LETTERS ENGRAVED WITH CONTRASTING COLOR FILL. DEVICE PLATE ENGRAVING SHALL BE 1/8" HIGH LETTERS WITH CONTRASTING COLOR FILL. COLORS TO CONFORM TO OWNER'S STANDARDS.

DISCONNECTS: 600 VAC HEAVY DUTY, FUSIBLE, SINGLE THROW. MANUFACTURER CUTLER-HAMMER DH SERIES OR EQUIVALENT. NEMA 12 ENCLOSURE INDOORS OR NEMA 3R ENCLOSURE OUTDOORS. COMPLETE WITH TYPEWRITTEN DIRECTORY, CIRCUIT BREAKERS (MULTIPLE-POLE INTERNAL TRIP), DEAD FRONT, LOCKING DOORS, UL LISTING, ETC. PROVIDE NEW PANEL TYPE WRITTEN DIRECTORIES IN PANELS WHERE BRANCH CIRCUITS ARE CHANGED.

WHERE JOB CONDITIONS REQUIRE REASONABLE CHANGES IN INDICATED LOCATIONS AND ARRANGEMENT, MAKE SUCH CHANGES WITHOUT EXTRA COST TO OWNER. THE DRAWINGS ARE NOT INTENDED TO BE SCALED FOR ROUGHING IN MEASUREMENTS AND NOT TO SERVE AS SHOP DRAWINGS.

PANELBOARDS: PANELS SHALL BE OF TYPE AND SIZE AS INDICATED ON THE DRAWINGS. PANEL ENCLOSURES SHALL BE RATED FOR THE SURROUNDING ENVIRONMENT, NEMA 12 FOR INDOOR, NEMA 3R FOR OUTDOOR, AND NEMA 4X FOR CORROSIVE ENVIRONMENTS. PANELS SHALL BE FULLY RATED TO INTERRUPT SYMMETRICAL SHORT-CIRCUIT CURRENT AVAILABLE AT TERMINALS. TRIM CLAMPS AND HINGES SHALL BE CONCEALED. LOAD CENTERS ARE NOT ACCEPTABLE.

OWNER SUPPLIED EQUIPMENT: COORDINATE ELECTRICAL CONNECTIONS FOR OWNER SUPPLIED EQUIPMENT WITH OWNER.

SUBSTITUTIONS: ALL SUBSTITUTIONS TO BE APPROVED BY OWNER, ARCHITECT, AND ENGINEER. ALL LIGHTING SUBSTITUTIONS MUST BE SUBMITTED IN WRITING TO THE ENGINEER FOR CONSIDERATION.

LIGHT FIXTURES: PROVIDE NEW LIGHT FIXTURES AS SCHEDULED COMPLETE WITH TRIM, LAMPS, FUSES, GASKETS, BALLASTS, ETC. AS SCHEDULED.

MECHANICAL EQUIPMENT: SEE PLANS FOR CONNECTION OF MECHANICAL EQUIPMENT. PROVIDE LIQUIDTIGHT FLEXIBLE CONDUIT (WITH EQUIPMENT GROUND CONDUCTOR) CONNECTION AT ALL MOTORS.

THESE ARE BASIC REQUIREMENTS. SEE DIVISION 26 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

NOTE: THIS IS A STANDARD ELECTRICAL LEGEND SHEET. THEREFORE, MANY OF THE SYMBOLS AND ABBREVIATIONS ON THIS SHEET MAY NOT BE USED ON THIS PROJECT

ABBREVIATIONS LEGEND

A	–	AMPERE
A/C	–	AIR CONDITIONING
ACP	–	AIR COMPRESSOR
AFF	–	ABOVE FINISHED FLOOR
AHU	–	AIR HANDLING UNIT
ARCH	–	ARCHITECTURAL
AMP	–	AMPLIFIER
ATS	–	AUTOMATIC TRANSFER SWITCH
AUX	–	AUXILIARY
BLDG	–	BUILDING
BLR	–	BOILER
C	–	CONDUIT
CB	–	CIRCUIT BREAKER
CCTV	–	CLOSED CIRCUIT TELEVISION
CKT	–	CIRCUIT
CP	–	CONTROL PANEL
CT	–	CURRENT TRANSFORMER
CU	–	COPPER
DB	–	DIRECT BURIED
DEF	–	DUEL ELEMENT FUSE
DP	–	DIMMABLE LIGHT PACK
DPDT	–	DOUBLE POLE DOUBLE THROW
DR	–	DRYER
DPIS	–	DOOR POSITION INDICATOR SWITCH
DVR	–	DIGITAL VIDEO RECORDER
DW	–	DISHWASHER
DWG	–	DRAWING
EA	–	EACH
EG	–	EARTH GROUND
EL	–	ELECTRIC LATCH
EMT	–	ELECTRICAL METALLIC TUBING
EQP	–	EQUIPMENT
EX	–	EXISTING
F	–	FAN
FACP	–	FIRE ALARM CONTROL PANEL
FARA	–	FIRE ALARM REMOTE ANNUNCIATOR
FBO	–	FURNISHED BY OTHERS
FLR	–	FLOOR
GFI	–	GROUND FAULT CIRCUIT INTERUPT
GND	–	GROUND
GRS	–	GALVANIZED RIGID STEEL
HD	–	HAND DRYER
HOA	–	HAND-OFF-AUTO
HP	–	HORSE POWER
HPS	–	HIGH PRESSURE SODIUM
HRV	–	HEAT RECOVERY VENTILATOR
HU	–	HEAT UNIT
HVAC	–	HEATING, VENTILATION, AIR CONDITION
KW	–	KILOWATTS
KVA	–	KILOVOLT AMPERES
MAX	–	MAXIMUM
MCB	–	MAIN CIRCUIT BREAKER
MDP	–	MAIN DISTRIBUTION PANEL
MFG	–	MANUFACTURER
MH	–	METAL HALIDE
MIN	–	MINIMUM
MON	–	MONITOR
N	–	NEUTRAL
N/A	–	NOT APPLICABLE
NC	–	NORMALLY CLOSED
NEC	–	NATIONAL ELECTRIC CODE
NO	–	NORMALLY OPEN
#	–	NUMBER
OCP	–	OVER CURRENT PROTECTION
P	–	POLE
PH	–	PHASE
PNL	–	PANEL
PP	–	POWER PACK
PVC	–	POLY VINYL CHLORIDE
PWR	–	POWER
RA	–	RANGE
RH	–	RANGE HOOD
RCPT	–	RECEPTACLE
RM	–	ROOM
SA	–	SURGE ARRESTOR
SPEC	–	SPECIFICATION
SPST	–	SINGLE POLE SINGLE THROW
SV	–	SOLENOID VALVE
TBD	–	TO BE DETERMINED
TC	–	TIME CLOCK
TEL	–	TELEPHONE
TEMP	–	TEMPERATURE
TTB	–	TELEPHONE TERMINAL BOARD
TVSS	–	TRANSIENT VOLTAGE SURGE SUPP.
TYP	–	TYPICAL
UG	–	UNDERGROUND
UOI	–	UNLESS OTHERWISE INDICATED
V	–	VOLT
VA	–	VOLT AMPERES
W	–	WATTS
W/	–	WITH
WD	–	WATER DETECTOR
WG	–	WIRE GUARD
WH	–	WATER HEATER
WL	–	WET LOCATION
WP	–	WEATHER PROOF
WS	–	WATER SOFTENER
W/O	–	WITHOUT
WTR	–	WATER
XDCR	–	PRESSURE TRANSDUCER
XFMR	–	TRANSFORMER
Y	–	WYE CONNECTED
Δ	–	DELTA CONNECTED
Ø	–	PHASE

MOUNTING HEIGHTS

DESCRIPTION	HEIGHT
WALL SWITCH	48"
CONVENIENCE OUTLET	16"
TELEPHONE OUTLET	16"
FIRE ALARM PULL STATION	42"
FIRE ALARM HORN STROBE	12" BELOW CEILING (AS LONG AS 80"-96" AFF)
FIRE ALARM HORN	90" AFF, 6" BELOW CEILING
EXIT SIGN	CENTER, 12" ABOVE DOOR
INTERCOM SPEAKER	88"
MOTOR CONTROL SWITCHES	42"
PANELBOARDS, ENCLOSURES	72" TO TOP

MOUNTING HEIGHTS ARE FROM FINISHED FLOOR TO BOTTOM OF BOX UNLESS NOTED OTHERWISE.

SHEET INDEX

NOTE:

ELECTRICAL DESIGN IS BASED ON INFORMATION PROVIDED BY StreamGO. DIMENSIONS/SIZES/LOCATIONS MAY CHANGE IF SUPPLIED EQUIPMENT IS DIFFERENT FROM StreamGO. FINAL DIMENSIONS/SIZES/LOCATIONS TO BE DETERMINED DURING THE PRODUCT SUBMITTAL PROCESS. CONSTRUCTION RELATED ACTIVITIES RELATED TO THE PACKAGED TREATMENT FACILITY SHALL NOT BEGIN UNTIL SUBMITTALS ARE APPROVED. BID PRICES SHALL BE BASED ON EQUIPMENT THAT IS BEING PROPOSED BY BIDDER SUBJECT TO OWNER AND ENGINEER APPROVAL. CHANGES IN EQUIPMENT DIMENSIONS/SIZES/LOCATIONS MUST BE MADE AT NO COST TO THE OWNER, INCLUDING ANY NECESSARY REDESIGN.

MONTANA
DANIEL LEE TINTZMAN
NO. 15453PE
REGISTERED PROFESSIONAL ENGINEER
02/6/24

Revision	Date	By
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Designed By: D.Tintzman, P.E.

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Owner
Flathead Lake Biological Station

Project Title
Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title
Electrical Symbols & Legends

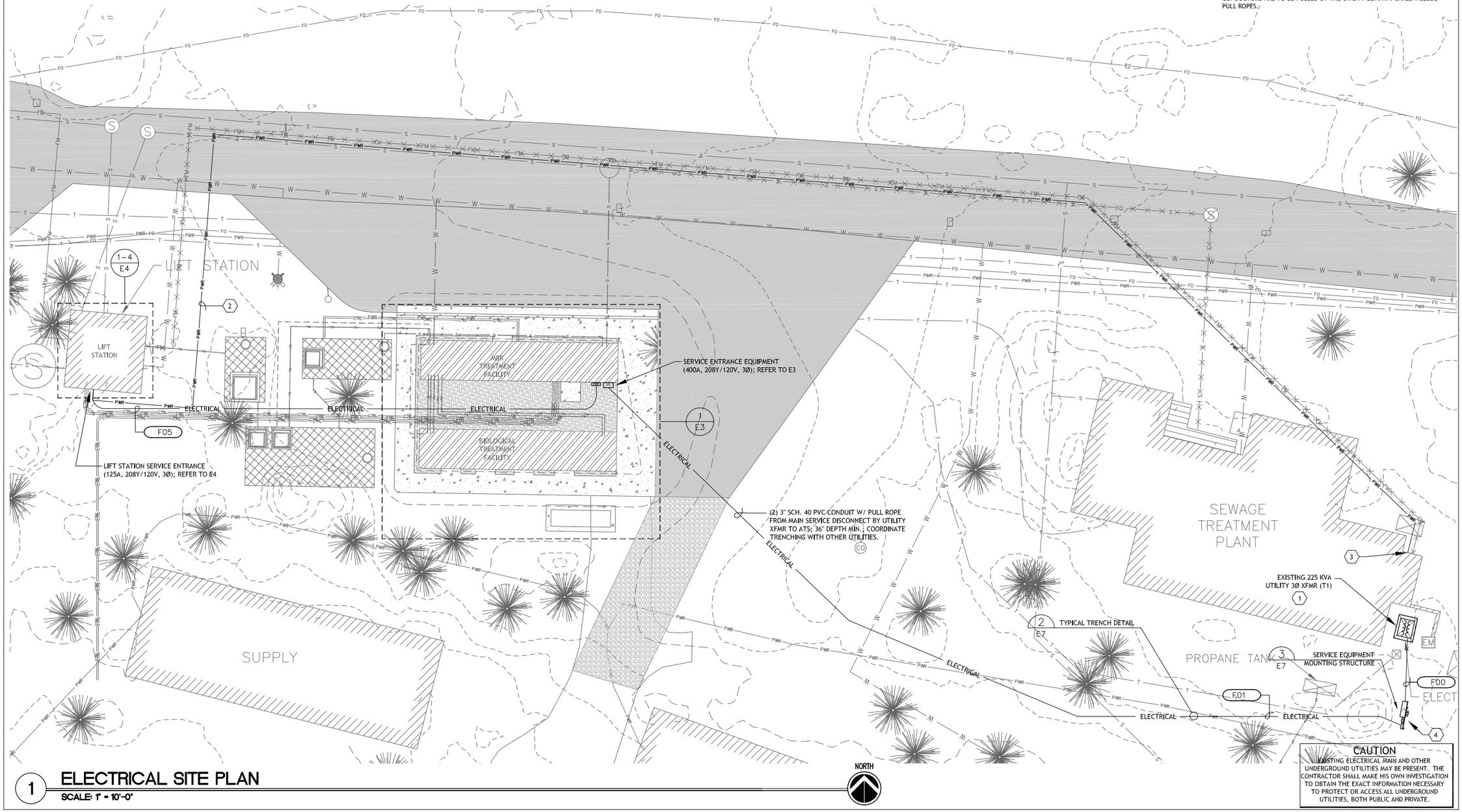
Sheet
E1

KEY NOTES (X)

1. COORDINATE WITH MISSION VALLEY POWER THE INSTALLATION OF A NEW ELECTRICAL SERVICE LINE FROM THE EXISTING 225 KVA UTILITY TRANSFORMER TO THE MBR TREATMENT FACILITY.
   - MVP SHALL PROVIDE: SECONDARY FEEDER TO THE LINE SIDE OF THE CT CAN, METERING CONDUCTORS, CTs, METER
   - CONTRACTOR SHALL PROVIDE: TRENCHING, CONDUIT, CT CAN, METER SOCKET, DISCONNECTS, AND CONDUCTORS FROM THE LOAD SIDE OF THE CT CAN TO THE MBR FACILITY.
2. DEMO EXISTING UNDERGROUND POWER FEEDER TO THE LIFT STATION. PULL ALL CONDUCTORS BACK TO THEIR SOURCE IN THE EXISTING SEWAGE TREATMENT PLANT. CONDUIT SHALL BE ABANDONED IN PLACE.
3. DISCONNECT LIFT STATION POWER SOURCE FROM THE MAIN DISTRIBUTION PANEL IN THE EXISTING SEWAGE TREATMENT PLANT.
4. SERVICE EQUIPMENT SHALL BE MOUNTED NEXT TO THE BACK ROAD BEHIND THE BUILDING, FAR ENOUGH AWAY TO ALLOW ADEQUATE SPACE FOR FUTURE DEMOLITION OF THE SEWAGE TREATMENT PLANT. FIELD COORDINATE EXACT LOCATION WITH MISSION VALLEY POWER.

GENERAL NOTES

1. ALL CONDUCTORS TO BE THHN, UNLESS NOTED OTHERWISE.
2. COORDINATE METER LOCATION, SOCKET TYPE, SERVICE ENTRANCE REQUIREMENTS, AND UTILITY XFMR CONNECTION WITH MISSION VALLEY POWER.
3. THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES ARE NOT REPRESENTED ON THIS DRAWING. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES IN WRITING, MAKE HIS OWN SITE INVESTIGATION, AND SHALL BE RESPONSIBLE FOR SECURING THE EXACT LOCATION OF ALL EXISTING UNDERGROUND UTILITIES, BOTH PRIMARY AND SECONDARY, PUBLIC AND PRIVATE, THAT MAY INTERFERE WITH ALL DEMOLITION, TRENCHING, EXCAVATION, AND NEW CONSTRUCTION WORK PRIOR TO BEGINNING EXCAVATION. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING UTILITY LINES, INCLUDING POWER, PHONE, GAS, WATER, AND SEWER, AND SHALL NOTIFY THE ENGINEER PRIOR TO ALL EXCAVATIONS. ALL UNDERGROUND UTILITY LINES DISTURBED SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR.
4. CONDUIT RUNS ON THIS DRAWING ARE SCHEMATIC AND SHOWN FOR IDENTIFICATION OF EXTERIOR POWER AND CONTROL WIRING REQUIREMENTS. SEE THE INTERIOR BUILDING ELECTRICAL PLAN(S) FOR CONDUIT ROUTING INSIDE OF THE BUILDING.
5. ALL CONDUIT FOR ELECTRICAL PRIMARY AND SECONDARY FEEDERS WHERE CONDUCTORS ARE TO BE PULLED BY THE UTILITY COMPANY SHALL INCLUDE PULL ROPES.



1 **ELECTRICAL SITE PLAN**

SCALE: 1" = 10'-0"

MONTANA — DANIEL LEE TINTZMAN — 15459PE — LICENSED PROFESSIONAL ENGINEER — 02/05/24

Revision	Date	By
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Approved By: D.Tintzman, P.E.
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Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title: **Electrical Site Plan**

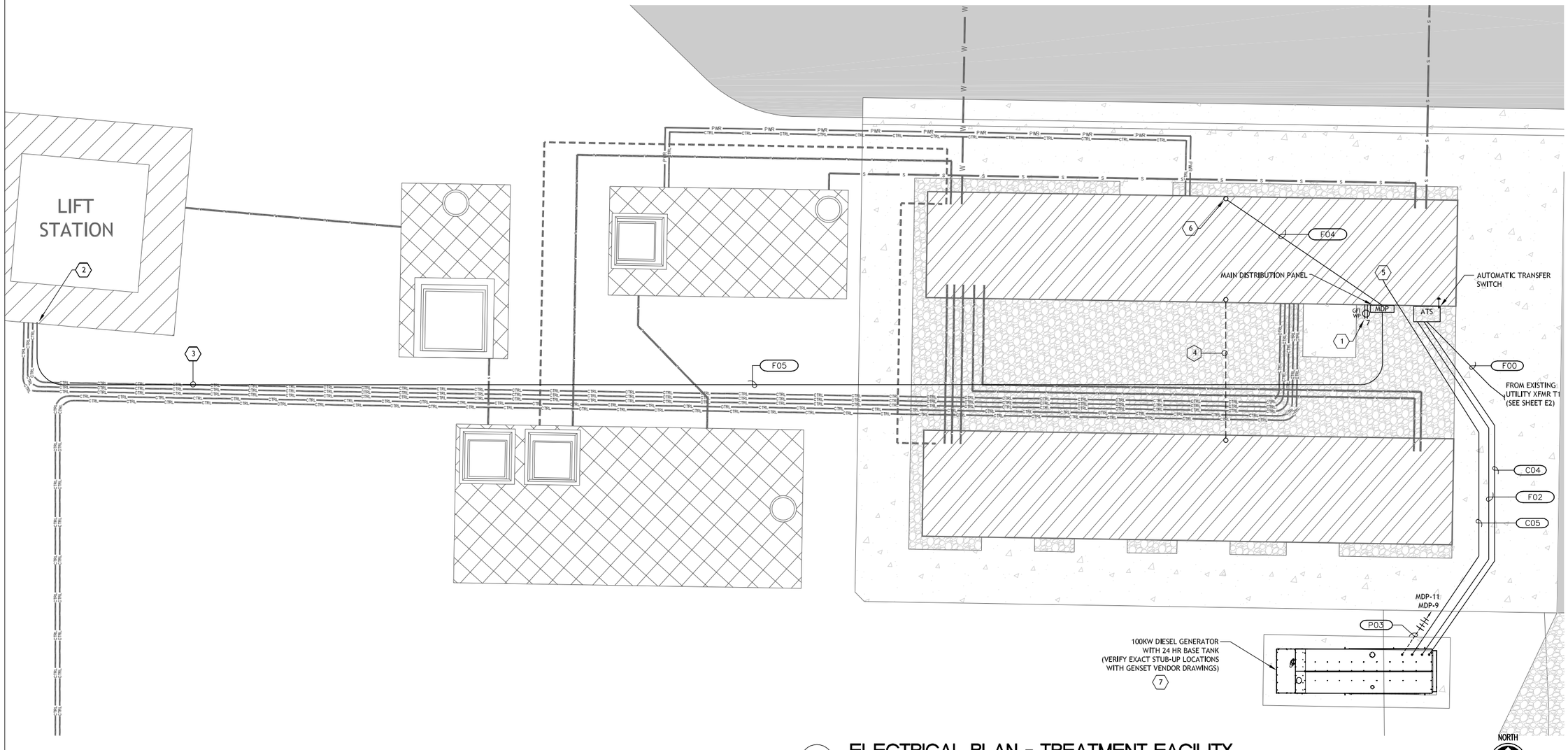
Sheet: **E2**

KEY NOTES (X)

1. PROVIDE AN EXTERIOR GFI RECEPTACLE WITH A METALLIC, LOCKABLE, WEATHERPROOF ENCLOSURE (LEVITON M5979GY).
2. SERVICE ENTRANCE FOR LIFT STATION. REFER TO DRAWING E-4.
3. INTERRUPT AND UTILIZE EXISTING LIFT STATION CONDUIT FEEDER IF POSSIBLE.
4. CONDUITS BETWEEN THE MBR FACILITY AND THE BIOLOGICAL FACILITY SHALL BE FURNISHED AND INSTALLED BY THE MBR SUPPLIER/CONTRACTOR.
5. GENERATOR ALARM SIGNALS SHALL TERMINATE AT THE MBR CONTROL PANEL. FIELD VERIFY EXACT LOCATION AND COORDINATE WITH MBR SUPPLIER.
6. SINGLE POINT POWER CONNECTION TO MBR POWER DISTRIBUTION PANEL. FIELD VERIFY EXACT LOCATION AND COORDINATE WITH MBR SUPPLIER.
7. INDUSTRIAL DIESEL ENGINE-DRIVEN GENERATOR SET (GENERAC MODEL SD100KW, OR EQUAL) WITH THE FOLLOWING FEATURES:
   - LEVEL 2 SOUND ATTENUATED ACOUSTIC STEEL ENCLOSURE
   - 24", 220 GALLON DOUBLE WALL BASETANK
   - EMERGENCY STOP KEY SWITCH (AUTO/OFF/MANUAL)
   - 400 AMP MLCB, 100% RATED, LSI ELECTRONIC TRIP
   - ENGINE COOLANT HEATER & ENCLOSURE HEATER
   - 5 YEAR WARRANTY

GENERAL NOTES

1. ALL CONDUCTORS TO BE THHN/THWN, UNLESS NOTED OTHERWISE.
2. COORDINATE ELECTRICAL METER TYPE AND SOCKET TYPE WITH THE LOCAL UTILITY COMPANY.
3. CONDUITS ON THIS DRAWING ARE SCHEMATIC AND SHOWN FOR IDENTIFICATION OF EXTERIOR CONDUIT RUNS. SEE CIVIL SITE UTILITY PLAN FOR CONSTRUCTION COORDINATION WITH OTHER UTILITIES.
4. SEE PACKAGED TREATMENT PLANT DRAWINGS FOR CONNECTIONS INSIDE THE FACILITY.
5. ELECTRICAL SERVICE EQUIPMENT, PANELS, AND OVERCURRENT PROTECTIVE DEVICES SHALL BE IN COMPLIANCE WITH NEC 110.9 AND 110.10. THE MAXIMUM AVAILABLE FAULT CURRENT AT EACH ELECTRICAL PANEL AND EQUIPMENT, TO INCLUDE IF PRESENT TRANSFORMERS, GENERATORS, AND ATS/MTS, SHALL BE CALCULATED AND PROVIDED TO THE ELECTRICAL INSPECTOR AT THE TIME OF INSPECTION FOR FIELD VERIFICATION.
6. NEC 110.24 (A) - THE SERVICE EQUIPMENT, TO INCLUDE IF PRESENT THE GENERATOR AND ATS/MTS, SHALL BE LEGIBLY MARKED IN THE FIELD WITH THE MAXIMUM AVAILABLE FAULT CURRENT, AND THE DATE THE FAULT CURRENT CALCULATION WAS PERFORMED IN ACCORDANCE TO NEC 110.21(B).



1 ELECTRICAL PLAN - TREATMENT FACILITY

SCALE: 1/4" = 1'-0"

MONTANA
DANIEL LEE TINTZMAN
PHONE 15459PE
LICENSED PROFESSIONAL ENGINEER
02/05/24

Revision	Date	By
Final	2-5-24	DT

Revision: Final
Plot Scale: 1:2
Drawn By: D.Tintzman, P.E.
Approved By: D.Tintzman, P.E.
Checked By: D.Tintzman, P.E.
Designed By: D.Tintzman, P.E.

Engineer

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Owner

Flathead Lake Biological Station

Project Title

Replace Sewer Treatment System

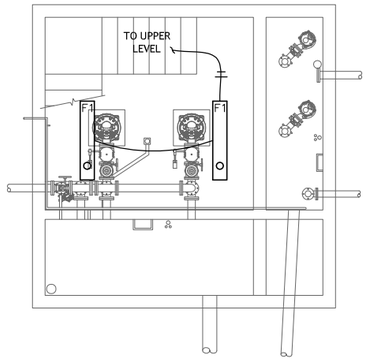
A/E #2016-01-01-02

Sheet Title

Treatment Facility Electrical Plan

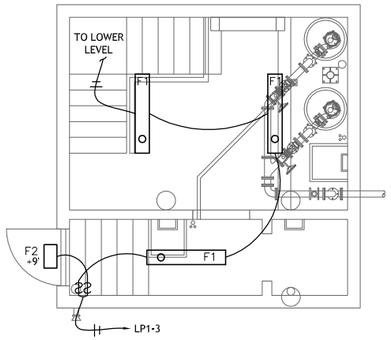
Sheet

E3



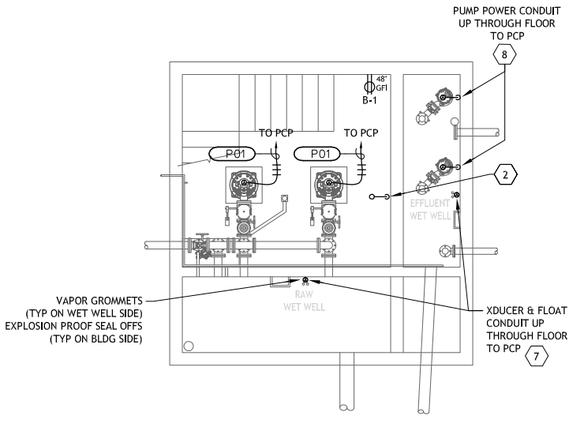
1 LIGHTING PLAN - LIFT STATION - LOWER LEVEL

SCALE: 1/4" = 1'-0"



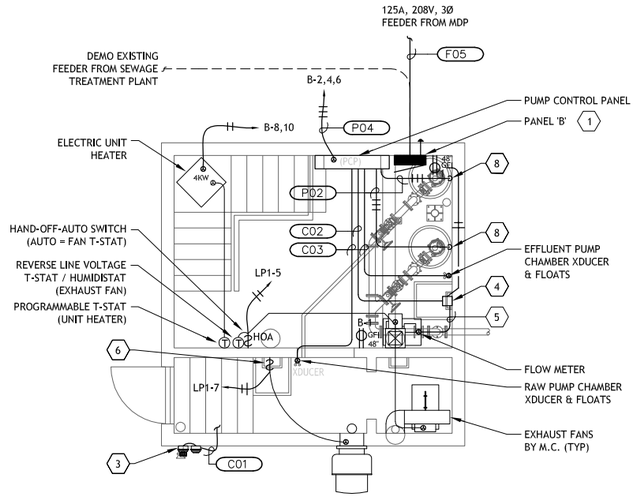
2 LIGHTING PLAN - LIFT STATION - UPPER LEVEL

SCALE: 1/4" = 1'-0"



3 POWER PLAN - LIFT STATION - LOWER LEVEL

SCALE: 1/4" = 1'-0"



4 POWER PLAN - LIFT STATION - UPPER LEVEL

SCALE: 1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE ANY NECESSARY TEMPORARY CONNECTIONS TO MAINTAIN SERVICES TO THE LIFT STATION UNTIL THE NEW SERVICE AND POWER DISTRIBUTION SYSTEM CAN BE INSTALLED. COORDINATE WITH ENGINEER/G.C.
2. REMOVE ALL WIRE BACK TO ITS SOURCE WHEREVER EXISTING CIRCUITS ARE ABANDONED OR DEMOLISHED. REMOVE ABANDONED RACEWAY AND BOXES UNLESS CONCEALED IN CONCRETE OR MASONRY CONSTRUCTION. CONDUIT THAT IS ABANDONED IN PLACE SHALL BE CUT FLUSH WITH THE FLOOR/CEILING AND SEALED. CONDUIT THAT IS IN GOOD CONDITION MAY BE REUSED.
3. REMOVE ALL EXISTING ELECTRICAL EQUIPMENT, SWITCHES, RECEPTACLES, AND PANELS FROM THE BUILDING AND DISPOSE OF IN AN APPROVED AND LEGAL MANNER.
4. REMOVE ALL LIGHTING FIXTURES, LAMPS, BALLASTS, AND ASSOCIATED HARDWARE. EPA REGULATIONS REQUIRE CONTROLLED DISPOSAL OF FLUORESCENT LIGHTING BALLAST CONTAINING PCBS WHEN REMOVED FROM SERVICE. THE BALLAST INVOLVED WERE GENERALLY MANUFACTURED BETWEEN 1950 AND 1979. CONTRACTOR'S DISPOSAL OF PCB CONTAINING BALLAST SHALL COMPLY WITH EPA REQUIREMENTS.
5. SEE MECHANICAL PLANS FOR RELATED DEMOLITION REQUIREMENTS.
6. EXISTING DEVICES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL COMPLETELY DEMO AND REMOVE ALL DEVICES FROM THE BUILDING.

GENERAL NOTES

1. ALL CONDUCTORS TO BE THHN/THWN, UNLESS NOTED OTHERWISE.
2. CONDUIT STUB OUTS ON THIS DRAWING ARE SCHEMATIC AND SHOWN FOR IDENTIFICATION OF EXTERIOR CONDUIT RUNS. SEE SITE PLAN FOR CONSTRUCTION REQUIREMENTS OUTSIDE OF THE BUILDING.
3. ALL CONDUIT RUN INSIDE OF THE BUILDING SHALL BE EXPOSED, SURFACE MOUNTED TO FINISHED WALLS AND CEILINGS.
4. LIGHTING LAYOUT AND PLACEMENT IS SCHEMATIC ONLY. COORDINATE EXACT LOCATION OF LIGHT FIXTURES WITH ENGINEER TO AVOID INTERFERENCE WITH MECHANICAL, PLUMBING, AND STRUCTURAL SYSTEMS.
5. REFER TO SHEET E-5 FOR THE LIGHTING FIXTURE SCHEDULE.
6. ELECTRICAL SERVICE EQUIPMENT, PANELS, AND OVERCURRENT PROTECTIVE DEVICES SHALL BE IN COMPLIANCE WITH NEC 110.9 AND 110.10. THE MAXIMUM AVAILABLE FAULT CURRENT AT EACH ELECTRICAL PANEL AND EQUIPMENT, TO INCLUDE IF PRESENT TRANSFORMERS, GENERATORS, AND ATS/MTS, SHALL BE CALCULATED AND PROVIDED TO THE ELECTRICAL INSPECTOR AT THE TIME OF INSPECTION FOR FIELD VERIFICATION.
7. NEC 110.24 (A) - THE SERVICE EQUIPMENT, TO INCLUDE IF PRESENT THE GENERATOR AND ATS/MTS, SHALL BE LEGIBLY MARKED IN THE FIELD WITH THE MAXIMUM AVAILABLE FAULT CURRENT, AND THE DATE THE FAULT CURRENT CALCULATION WAS PERFORMED IN ACCORDANCE TO NEC 110.21(B).

KEY NOTES (X)

1. NEW POWER PANEL 'B'. THE MAIN CIRCUIT BREAKER OF THE PANEL SHALL BE THE BUILDING SERVICE ENTRANCE DISCONNECTING MEANS. INSTALL A GROUNDING ELECTRODE CONDUCTOR THAT TERMINATES ON A GROUNDING TERMINAL IN THE PANEL, SIZED ACCORDING TO NEC 250.66. CONNECT THE EQUIPMENT GROUNDING CONDUCTOR IN THE FEEDER FROM THE MDP TO THE GROUNDING TERMINAL OF THE PANEL. A NEUTRAL-TO-GROUND CONNECTION IS NOT PERMITTED AT THIS POINT.
2. SALVAGE AND MAINTAIN AN OPEN SPARE CONDUIT BETWEEN FLOORS FOR A FUTURE LOWER LEVEL HEATER IF NEEDED.
3. PROVIDE AN AUDIBLE ALARM (EDWARDS 868 SERIES, OR EQUAL) AND A VISUAL ALARM (EDWARDS 125 CLASS STROBE, OR EQUAL) THAT SHALL BE ACTIVATED BY ALARM CONDITIONS FROM THE PUMP CONTROL PANEL. THE AUDIBLE ALARM SHALL BE SWITCHED SEPARATELY FROM THE VISUAL ALARM TO ALLOW THE SYSTEM OPERATOR TO BE ABLE TO TURN EITHER ALARM ON/OFF OR TO DISABLE EITHER ALARM. COORDINATE ALARM DEVICE VOLTAGES WITH CONTROL PANEL OUTPUTS.
4. PROVIDE 120V CONNECTION TO FLOW METER REMOTE CONVERTER BOX. INSTALL LOW VOLTAGE CONDUCTORS BETWEEN THE FLOW METER CONVERTER BOX AND THE CONTROL PANELS AS REQUIRED TO PRODUCE A 4-20mA FLOW RATE AND A DIGITAL PULSE OUTPUT TO THE PUMP CONTROL PANEL.
5. INSTALL THE FACTORY PROVIDED McCROMETER CABLE FROM THE FLOW METER TO THE REMOTE CONVERTER BOX IN 1/2" CONDUIT.
6. EXHAUST FAN SHALL BE CONTROLLED BY A MANUAL SWITCH NEAR THE CAUTION SIGN AT THE BASE OF THE STAIRS. PROVIDE A RED SWITCH & A RED FACE PLATE.
7. PROVIDE 3/4"C INTO WET WELL FOR TRANSDUCER AND 2"C FOR FLOAT CABLES. VERIFY CONDUIT SIZES AND CABLING REQUIREMENTS WITH PUMP MFG. CONTRACTOR MAY USE EXISTING CONDUIT SLEEVES IF THEY ARE ACCESSIBLE. INSTALL VAPOR GROMMETS ON THE WET WELL SIDE. PROVIDE CLASS1, DIVISION 1 EXPLOSION PROOF SEAL OFFS ON THE BUILDING SIDE (THOMAS & BETTS #EVHF-2, OR EQUAL).
8. PROVIDE 3/4"C INTO WET WELL FOR PUMP POWER. CONTRACTOR MAY USE EXISTING CONDUIT SLEEVES IF THEY ARE ACCESSIBLE. INSTALL VAPOR GROMMETS ON THE WET WELL SIDE. PROVIDE CLASS1, DIVISION 1 EXPLOSION PROOF SEAL OFFS ON THE BUILDING SIDE (THOMAS & BETTS #EVHF-2, OR EQUAL).

Non-Dwelling Feeder/Service Load Calculation				
Project: FLBS Lift Station				
Computed Load:				
Recpt Load (actual)	3 quantity @	180 VA/ea	540	VA
Multioutlet Assemblies	0 Five ft. sections@	180 VA/ea	0	VA
Total known Recpt Load			540	
Demand Factor (1)			540	
Unknown Recpt Load	0 square feet @	1 VA/sq ft	0	VA
Lighting Load (known)		177 VA	177	VA
General Lighting (unknown)	0 square feet @	2 VA/sq ft	0	VA
Track Lighting	0 linear feet @	75 VA/ln ft	0	VA
Sign Lighting	0	1200 VA	0	VA
Show Window Lighting	0 linear feet @	200 VA/ln ft	0	VA
Continuous Loads Demand Factor (3)			221	VA
Kitchen Equipment				
Ref/Freezer	0	1200 VA/ea	0	VA
Microwave	0	1440 VA/ea	0	VA
Dishwasher	0	1200 VA/ea	0	VA
Cooktop	0	8000 VA/ea	0	VA
Appliance Branch Circuit	0	1500 VA/ea	0	VA
Total Kitchen			0	VA
Kitchen Loads Demand Factor (4)			0	VA
HVAC (non-coincident) @ 100% (2)				
Unit Heater	1	4000 VA/ea	4000	VA
Exhaust Fan	1	2090 VA/ea	2090	VA
Total HVAC			6,090	VA
Motor Loads				
Raw Sewage Pump (5HP)	2	6665 VA/ea	13330	VA
Effluent Pump (2HP)	2	2810 VA/ea	5620	VA
		VA/ea	0	VA
Total Motor Loads			18,950	VA
Total Load			**25.8**	**kVA**
208V, 3-phase Service			72	A

(1) 1ST 10KVA@100%, REM.@50% DEMAND FACTOR (NEC TABLE 220.44)
(2) 100% DEMAND FACTOR NEC 220.51
(3) CONTINUOUS LOAD AT 125%
(4) 80% DEMAND FACTOR NEC 220.56

CAUTION

THE WET WELL IS A CLASS I, DIVISION I, GROUP D HAZARDOUS ENVIRONMENT. ALL DEVICES, BOXES, FITTINGS, JOINTS, AND WIRING METHODS WITHIN THE WET WELL, AS WELL AS WITHIN 5 FEET OF ANY OPENING, MUST BE RATED AND APPROVED FOR CLASS I, DIVISION I. COMPLY WITH ALL REQUIREMENTS OF ARTICLE 501 OF THE NATIONAL ELECTRICAL CODE. PROVIDE A WATERTIGHT SEAL AND A SEPARATE STRAIN RELIEF FOR EACH FLEXIBLE CABLE IN THE WET WELL.

NOTE

THE LIFT STATION MUST REMAIN OPERABLE THROUGHOUT CONSTRUCTION. PHASE ALL ELECTRICAL IMPROVEMENTS TO MAINTAIN UTILITY AND GENERATOR POWER AT ALL TIMES OR PROVIDE AN ALTERNATE TEMPORARY PUMPING STATION AS APPROVED BY THE ENGINEER.

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Engineer

Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title: **Lift Station Electrical Plan**

Sheet: **E4**

PANELBOARD SCHEDULE

MAIN BREAKER: 125 AMP | PANEL: B | TOTAL CALCULATED LOAD 25.80 KVA
MOUNTING: SURFACE | 120/208,3P,4W
BRACING: 10 Kaic | 125 AMP

CIRCUIT NO.	DESCRIPTION	OCP	LOAD TYPE	LOAD (VA)	LOAD (A)	PH	(A)	(VA)	TYPE	OCP	CIRCUIT DESCRIPTION	CIRCUIT NO.
1	Recpt - Utility	20A-1P	R	540	4.5	A	52.6	6317	N	70A-3P	Pump Control Panel	2
3	Lights	20A-1P	C	177	1.5	B	52.6	6317	N	"	"	4
5	Exhaust Fans	20A-1P	N	1393	11.6	C	52.6	6317	N	"	"	6
7	Exhaust Fan (Raw Chamber)	20A-1P	N	697	5.8	A	16.7	2000	H	20A-2P	Unit Heater	8
9	SPARE	20A-1P				B	16.7	2000	H	"	"	10
11	SPARE	20A-1P				C				20A-2P	SPARE	12
13	SPARE	20A-1P				A				"	"	14
15	SPARE	20A-1P				B				20A-1P	SPARE	16
17	SPARE	20A-1P				C				20A-1P	SPARE	18
19	SPARE	20A-1P				A				20A-1P	SPARE	20
21	SPARE	20A-1P				B				20A-1P	SPARE	22
23	SPARE	20A-1P				C				20A-1P	SPARE	24
25	SPARE	20A-1P				A				20A-1P	SPARE	26
27	SPARE	20A-1P				B				20A-1P	SPARE	28
29	SPARE	20A-1P				C				20A-1P	SPARE	30
						A						
						B						
						C						
						A						
						B						
						C						

NOTES:

LOAD:	CONNECTED	CALCULATED
(C)ontinuous:	177 x 1.25 =	221 VA
(R)ec (1st 10 kva):	540 x 1.00 =	540 VA
(R)ec (remainder):	x 0.50 =	VA
(N)on-continuous:	21040 x 1.00 =	21040 VA
(H)eating:	4000 x 1.00 =	4000 VA
(A)ir conditioning:	x 1.00 =	VA
(L)argest motor:	x 1.25 =	VA
TOTAL ADDITIONAL LOAD:	VA	25801 VA
		72 AMPS

NOTE: HEATING AND COOLING LOADS ARE NON-SIMULTANEOUS

1 PANEL SCHEDULE 'B'

SCALE: N.T.S.

PANELBOARD SCHEDULE

MAIN BREAKER: MLO | PANEL: MDP | TOTAL CALCULATED LOAD 66.48 KVA
MOUNTING: SURFACE | 120/208,3P,4W
BRACING: 10 Kaic | 400 AMP

CIRCUIT NO.	DESCRIPTION	OCP	LOAD TYPE	LOAD (VA)	LOAD (A)	PH	(A)	(VA)	TYPE	OCP	CIRCUIT DESCRIPTION	CIRCUIT NO.
1	Panel B (Lift Station)	125A-3P		9553	79.6	A	102.7	12333	N	200A-3P	MBR Treatment Facility	2
3	"	"		8494	70.7	B	102.7	12333	N	"	"	4
5	"	"		7710	64.2	C	102.7	12333	N	"	"	6
7	Recpt - Exterior	20A-1P	R	180	1.5	A				20A-1P	SPARE	8
9	Genset Heaters	20A-1P	H	2000	16.7	B				20A-1P	SPARE	10
11	Genset Battery Charger	20A-1P	C	1201	10.0	C				20A-1P	SPARE	12
13	SPARE	20A-1P				A				20A-1P	SPARE	14
15	SPACE	20A-1P				B				20A-1P	SPARE	16
17	SPARE	20A-1P				C				20A-1P	SPARE	18
19	SPARE	20A-1P				A				20A-1P	SPARE	20
21	SPARE	20A-1P				B				20A-1P	SPARE	22
23	SPARE	20A-1P				C				20A-1P	SPARE	24
						A						
						B						
						C						
						A						
						B						
						C						

NOTES:

LOAD:	CONNECTED	CALCULATED
(C)ontinuous:	1378 x 1.25 =	1722 VA
(R)ec (1st 10 kva):	720 x 1.00 =	720 VA
(R)ec (remainder):	x 0.50 =	VA
(N)on-continuous:	58039 x 1.00 =	58039 VA
(H)eating:	6000 x 1.00 =	6000 VA
(A)ir conditioning:	x 1.00 =	VA
(L)argest motor:	x 1.25 =	VA
TOTAL ADDITIONAL LOAD:	VA	66481 VA
		185 AMPS

NOTE: HEATING AND COOLING LOADS ARE NON-SIMULTANEOUS

2 PANEL SCHEDULE 'MDP'

SCALE: N.T.S.

CONDUIT & WIRE SCHEDULE

TAG	CONDUIT SIZE	WIRE SIZE	FROM	TO	AMPS
F00	4"	by UTILITY CO.	EXISTING UTILITY XFMR T1	MSD	400A, 3Ø,4W
F01	[2] 3"	[2]4#250AL,1#1AL GND	MSD	ATS	400A, 3Ø,4W+G
F02	3-1/2"	4#500, 1#3 GND	GENERATOR	ATS	400A, 3Ø,4W+G
F03	3-1/2"	4#500, 1#3 GND	ATS	MDP	400A, 3Ø,4W+G
F04	2"	4#3/0, 1#6 GND	MDP	MBR TREATMENT FACILITY	200A, 3Ø,4W+G
F05	1-1/2"	4#1, 1#6 GND	MDP	LIFT STATION (PANEL B)	125A, 3Ø,4W+G
P01	3/4"	3#10, 1#10 GND	PUMP CONTROL PANEL	RAW SEWAGE PUMP (5HP)	25A, 3Ø,3W+G
P02	3/4"	3#12, 1#12 GND	PUMP CONTROL PANEL	EFFLUENT PUMP (2HP)	20A, 3Ø, 3W+G
P03	3/4"	2#10, 1#10 GND	PANEL U2	GENERATOR BATT. CHRG.	20A, 1Ø, 2W+G
		2#10, 1#10 GND	PANEL U2	GENERATOR BLK HEATER	20A, 1Ø, 2W+G
P04	1-1/4"	4#4, 1#8 GND	PANEL B	PUMP CONTROL PANEL	70A, 3Ø,4W+G
C01	1/2"	4#14 Cu STRANDED	PUMP CONTROL PANEL	AUDIO/VISUAL ALARMS	---
C02	1/2"	4#16 Cu TSP	FLOW METER	PUMP CONTROL PANEL	---
C03	2"	by PUMP CONTRACTOR	WET WELL FLOATS	PUMP CONTROL PANEL	---
	3/4"	4#18 Cu TSP	WET WELL LEVEL XDUCER	PUMP CONTROL PANEL	4-20mA
C04	3/4"	5#16 Cu STRANDED	GENERATOR STARTER	ATS	
C05	3/4"	2#14 + RS485 DATA	GEN. COMMON ALARM	MBR CONTROL PANEL	

NOTES:
1. All other branch circuits are 2#12, 1#12 GND - 3/4"C.
2. All conductors are sized per AWG and shall be 75°C copper wire with 60°C terminals up to 100 amps and 75°C wire and terminals thereafter.
3. Aluminum conductors are acceptable for all feeders 200 Amps or larger. Upsize wire and conduit sizes accordingly to maintain the required ampacity.
4. Wire sizes and combinations are suggestions based upon available load information at the time of drawing release. The contractor shall verify all equipment name plates for actual load ratings.
5. #10AWG and smaller conductors shall be solid wire. #8AWG and larger conductors shall be stranded.
6. The contractor shall derate conductor ampacity for elevated temperatures over ambient and for multiple conductors in raceways or conduit per NEC requirements.

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	LAMPS PER FIXTURE	WATTS PER LAMP	LAMP SIZE	VOLTS	MAX WATTS	MOUNTING	MFG & P/N	NOTES
F1	Vaportight Industrial Surface LED	1	33	4,000 Lumen LED 4000k	120	33	Surface	Lithonia VAP-4000LM-PCL-MD-MVOLT-GZ10-40K-80CRI	
F2	Wall Pack	1	12	1,500 Lumen LED 4000k	120	12	Wall	Lithonia WST LED P1 40K VW MVOLT PE DBLXD	Switch on photo-cell; Feed-thru wiring; Black in color

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Engineer

Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System
A/E #2016-01-01-02

Sheet Title: **Electrical Schedules**

Sheet: **E5**

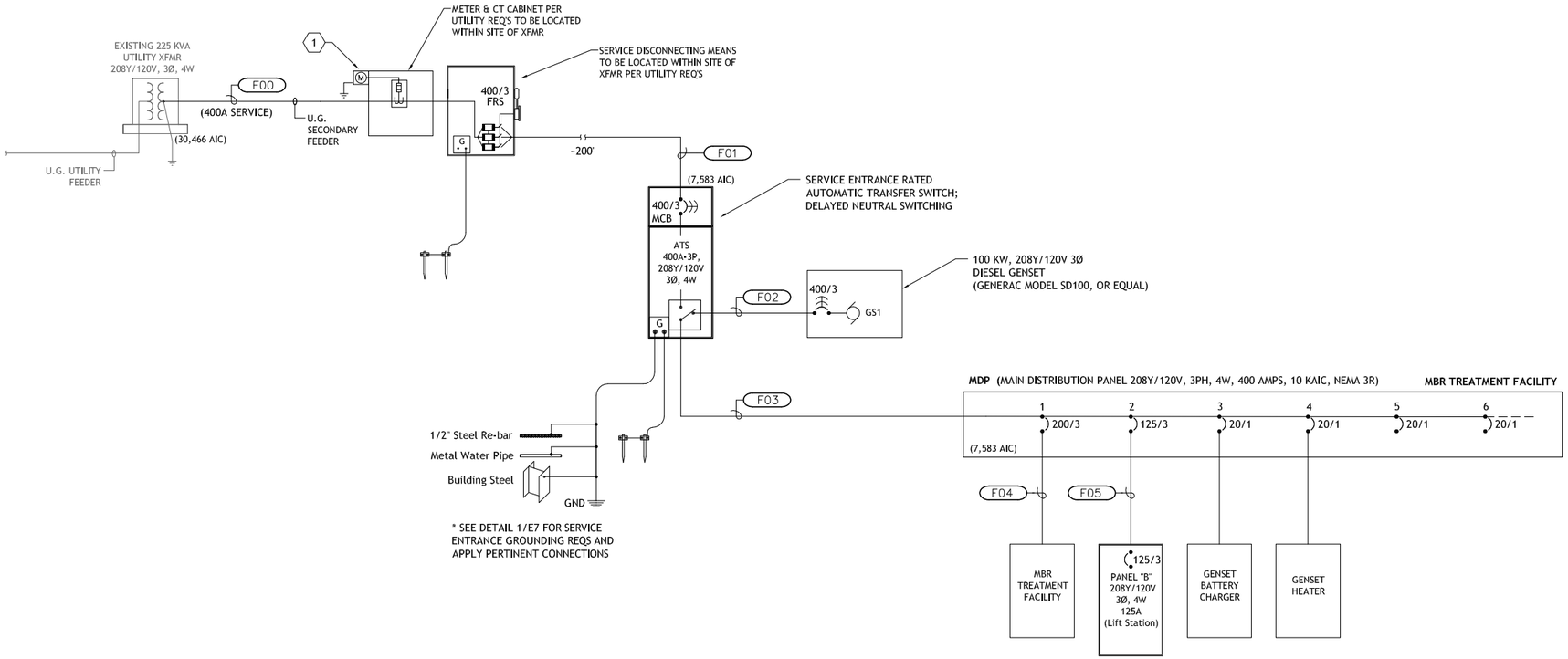
GENERAL NOTES

A. ELECTRICAL SERVICE EQUIPMENT, PANELS, AND OVERCURRENT PROTECTIVE DEVICES SHALL BE IN COMPLIANCE WITH NEC 110.9 AND 110.10. THE MAXIMUM AVAILABLE FAULT CURRENT AT EACH ELECTRICAL PANEL AND EQUIPMENT, TO INCLUDE IF PRESENT TRANSFORMERS, GENERATORS, AND ATS/MTS, SHALL BE CALCULATED AND PROVIDED TO THE ELECTRICAL INSPECTOR AT THE TIME OF INSPECTION FOR FIELD VERIFICATION.

B. NEC 110.24 (A) - THE SERVICE EQUIPMENT, TO INCLUDE IF PRESENT THE GENERATOR AND ATS/MTS, SHALL BE LEGIBLY MARKED IN THE FIELD WITH THE MAXIMUM AVAILABLE FAULT CURRENT, AND THE DATE THE FAULT CURRENT CALCULATION WAS PERFORMED IN ACCORDANCE TO NEC 110.21(B).

KEY NOTES (X)

1. METERING EQUIPMENT SHALL BE SUBMITTED TO THE LOCAL UTILITY COMPANY FOR SIGNATURE APPROVAL AND THEN TO THE ELECTRICAL ENGINEER OF RECORD FOR APPROVAL. PROVIDE A EUSERC COMPLIANT, RING TYPE METER BASE WITH BYPASS PROVISIONS. PROVIDE A 1" CONDUIT BETWEEN THE CT CAN AND THE METER BASE.



1 ELECTRICAL RISER DIAGRAM

SCALE: N.T.S.

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Project Title

Replace Sewer Treatment System

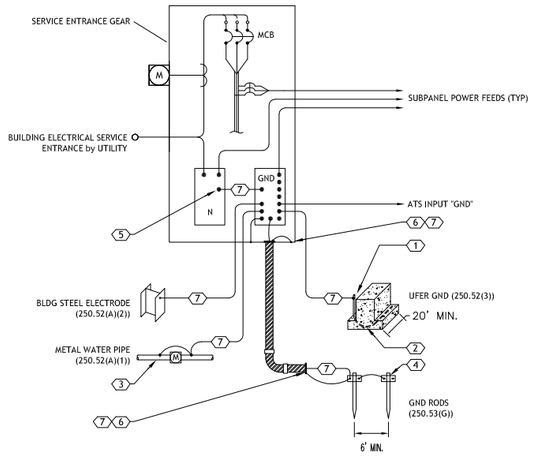
A/E #2016-01-01-02

Sheet Title

Electrical Riser Diagram

Sheet

E6



DETAIL KEY NOTES: (X)

1. PROVIDE ENOUGH LENGTH TO TERMINATE DIRECTLY TO GROUND BUS.
2. INSTALL AN ELECTRODE ENCASED BY AT LEAST 2" OF CONCRETE, LOCATED WITHIN AND NEAR THE BOTTOM OF A CONCRETE FOUNDATION OR FOOTING THAT IS IN DIRECT CONTACT WITH THE EARTH, CONSISTING OF AT LEAST 20 FT OF ZINC GALVANIZED OR OTHER ELECTRICALLY CONDUCTIVE COATED STEEL REINFORCING BARS OF NOT LESS THAN ½" IN DIAMETER, OR CONSISTING OF AT LEAST 20 FT OF BARE COPPER CONDUCTOR NOT SMALLER THAN #4 AWG. REINFORCING BARS SHALL BE PERMITTED TO BE BONDED TOGETHER BY THE USUAL STEEL TIE WIRES OR OTHER EFFECTIVE MEANS.
3. GROUND THE INTERIOR METAL WATER PIPE WITHIN 5 FEET OF THE WATER PIPE ENTRANCE TO THE BUILDING. GROUNDING PATH CONTINUITY, OR THE BONDING CONNECTION TO INTERIOR PIPING, MUST NOT RELY ON WATER METERS OR SIMILAR EQUIPMENT (NEC 250.53(D)).
4. (2) 5/8" x 8'-0" COPPER CLAD STEEL GROUND RODS, 25 OHMS OR LESS. CLAMPS SHALL BE RATED FOR DIRECT BURIAL.
5. PROVIDE COPPER BONDING JUMPER SIZED PER NEC 250.28(D) OR FACTORY PROVIDED NEUTRAL TO GROUND BAR LINK. THIS IS THE ONLY PLACE IN THE BUILDING WHERE NEUTRAL TO GROUND SHALL BE BONDED TOGETHER.
6. BOND ALL METAL RACEWAYS CONTAINING GROUNDING ELECTRODE CONDUCTORS AT BOTH ENDS AS REQUIRED BY NEC 250.64(E). PROVIDE GROUNDING TYPE BUSHINGS AND FITTINGS.
7. BONDING JUMPERS AND COPPER GROUNDING ELECTRODE CONDUCTORS SHALL BE SIZED BASED UPON ELECTRICAL SERVICE SIZE (NEC 250.66).

1 TYPICAL BUILDING GROUNDING DETAIL

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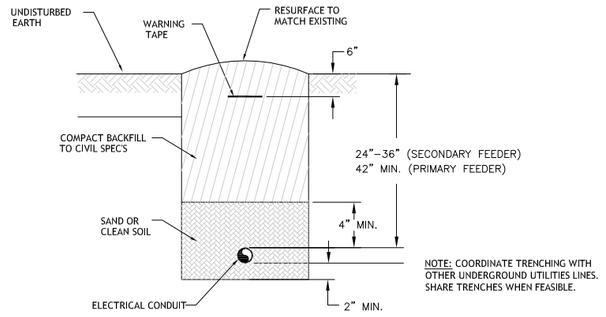

2 TYPICAL TRENCH DETAIL

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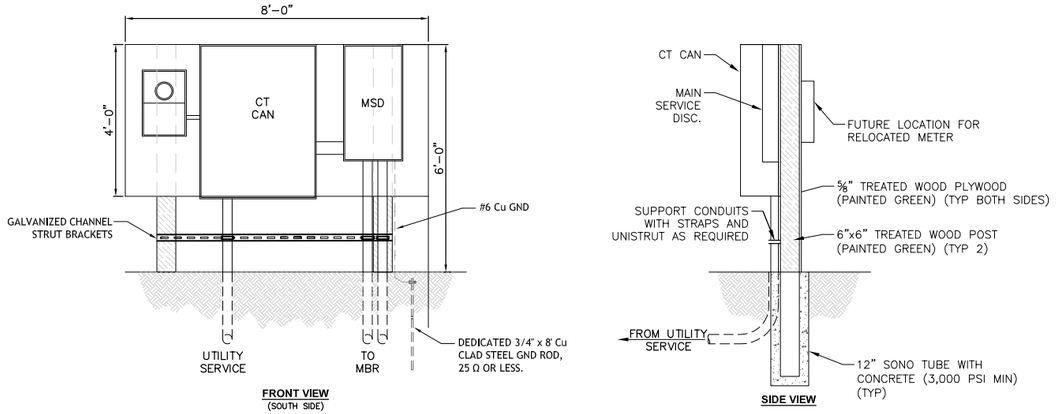


3 SERVICE EQUIPMENT MOUNTING DETAIL

SCALE: N.T.S.

MONTANA
DANIEL LEE TINTZMAN
ENGINEER 15453PE
LICENSED PROFESSIONAL ENGINEER
02/05/24

Revision	Date	By
Final	2-5-24	DT

Revision: Final
Plot Scale: 1:2
Drawn By: D.Tintzman, P.E.
Approved By: D.Tintzman, P.E.
Checked By: D.Tintzman, P.E.
Designed By: D.Tintzman, P.E.

Engineer

KBE ENGINEERING
P.O. Box 8694
Kalispell, MT 59904
Phone (406) 212-1624
KBengineers@centurytel.net

Owner: Flathead Lake Biological Station

Project Title: Replace Sewer Treatment System

A/E #2016-01-01-02

Sheet Title: **Electrical Details**

Sheet: **E7**

APPENDIX B

Construction Permit Forms

CHECKLIST FOR:

LAKE COUNTY WASTEWATER TREATMENT SYSTEM (WWTS) PERMIT APPLICATION

This checklist is to assure your application is complete so it can be processed promptly. Please use the check boxes next to each item. Additional information may be required as the application goes through the review process. Examples include but are not limited to: easement, deed restriction, shared user agreement, property line staking, etc.

Submit this checklist, application, wastewater system design, and fee to:

Lake County Environmental Health
106 Fourth Avenue East
Polson, MT 59860

Phone: 406-883-7236
Email: envhealth@lakemt.gov

Please check that you have completed the following:

- ☐ **Check payable to Lake County Environmental Health Department (L.C.E.H)**
- ☐ **Property owner information**
- ☐ **Wastewater Treatment System Designer/Licensed Installer contact information**
- ☐ **If agent signs the application for owner, include the Agent Certification Form**
- ☐ **Property legal description**
- ☐ **Location map or directions to assist staff in finding the property**
- ☐ **Project description**
- ☐ **Floor plans for each level of each structure with living quarters – Label rooms, e.g. bedrooms, kitchen, basement**
- ☐ **Site Plan that includes the following: (include any/all depending upon the nature of your request)**
  - ☐ Scale – for example 1 inch = 2 feet
  - ☐ North directional arrow
  - ☐ Property lines
  - ☐ All existing & proposed structures
  - ☐ Driveways & parking areas
  - ☐ Utility lines
  - ☐ Any existing wastewater treatment system
  - ☐ Proposed wastewater treatment system
  - ☐ All existing or proposed wells, developed springs, or cisterns and water lines
  - ☐ All streams, lakes, springs, ponds, wetlands, irrigation ditches and/or other surface water within 100' of property lines
- ☐ **Wastewater Treatment System Design, in compliance with DEQ Circular 4 – Montana Standards for Subsurface Wastewater Treatment Systems, that includes the following:**
  - ☐ Soil profile information
  - ☐ Percolation test results, if required
  - ☐ Ground water monitoring results, if required
  - ☐ Design Flow
  - ☐ Sewer line specifications
  - ☐ Septic tank/risers/effluent filter specifications
  - ☐ Effluent distribution system
  - ☐ Dosing and Pressure Distribution specifications
  - ☐ Soil absorption system including application rate
  - ☐ Compliance with MCA 75-5 Montana Water Quality Act, including but not limited to non-significance determination, background nitrate test, well pump test, or well triangulation

See the Lake County Environmental Health Department webpage for regulations and other information:
www.lakemt.gov/183/wastewater-treatment

LAKE COUNTY WASTEWATER TREATMENT SYSTEM (WWTS) PERMIT APPLICATION

FOR RECEIPTING ONLY:

PERMIT #_____ **APPLICATION DATE:**_____

CHECK #_____

LAKE COUNTY ENVIRONMENTAL HEALTH (LCEH)
106 FOURTH AVENUE EAST
POLSON, MT 59860

PHONE: 406-883-7236
EMAIL: envhealth@lakemt.gov

RETURN THE COMPLETED APPLICATION WITH THE APPROPRIATE FEE TO THE ABOVE ADDRESS.
CHECKS MUST BE MADE PAYABLE TO LAKE COUNTY ENVIRONMENTAL HEALTH (L.C.E.H.)

SELECT ONE OF THE FOLLOWING PERMIT TYPES:

☐ **$300— NEW INSTALLATION OR REPLACEMENT** *

☐ **$200— ALTERATION W/ NEW COMPONENTS——** *PHYSICAL CHANGE TO THE EXISTING WWTS THAT ALTERS THE CHARACTERISTICS OF THE WWTS (E.G. CONNECTION TO MAIN/TANK/DRAINFIELD, ADDITION OF TANK)*

☐ **$100— ALTERATION W/ NO NEW COMPONENTS—***CHANGE OF USE OF UNIT (E.G. CONVERSION TO VACATION RENTAL, ADDITION OF 1 BEDROOM, REPLACEMENT OF STRUCTURE WITH SAME TYPE & BEDROOM #)*

DID YOU KNOW!

* **AS PER A.R.M. 17.36.920 (5)**, "*FOR PERMITS ISSUED FOR THE REPLACEMENT OF WASTEWATER TREATMENT SYSTEMS THAT DO NOT MEET THE MINIMUM STANDARDS FOR SUBDIVISION AS SET OUT IN ARM TITLE 17, CHAPTER 36, SUBCHAPTER 3, THE REVIEWING AUTHORITY SHALL NOTIFY THE OWNER THAT THE DESIGN MAY LIMIT THE ABILITY OF THE OWNER TO SUBDIVIDE THE PROPERTY*".

PROPERTY INFORMATION

PROPERTY OWNER(S): _____

MAILING ADDRESS: _____ CITY: _____ STATE/ZIP: _____

EMAIL: _____ PHONE: _____

PROPERTY ADDRESS: _____ CITY: _____

SUBDIVISION/COS/LEGAL DESCRIPTION: _____

LOT: _____ BLOCK: _____ PARCEL SIZE: _____ SECTION: _____ TOWNSHIP: _____N. RANGE: _____W.

GEOCODE: 15 - _____ - _____ - _____ - _____ - _____ - _____

WWTS CONSULTANT & INSTALLER INFORMATION

WWTS DESIGNER/CONSULTANT: _____ PHONE: _____

MAILING ADDRESS: _____ CITY: _____ STATE/ZIP: _____

WWTS LICENSED INSTALLER: _____ PHONE: _____

MAILING ADDRESS: _____ CITY: _____ STATE/ZIP: _____

EXISTING & PROPOSED SERVICES

PLEASE CIRCLE ALL THAT APPLY AND DESCRIBE EACH ITEM BELOW

- **REASONS FOR PROPOSED WWTS:** NEW REPLACEMENT ALTERATION OF EXISTING VACATION RENTAL
- **STRUCTURE(S):** SINGLE-FAMILY MULTI-FAMILY MOBILE HOME COMMERCIAL GARAGE/SHOP OTHER
- **HOW MANY STRUCTURES DEPENDENT UPON WWTS:** _____
- *ADDITIONAL PROPOSED SERVICES (E.G. RV HOOK-UP, BATHROOM IN SHOP):* _____
- **TOTAL BEDROOM #:** _____
- **WATER SYSTEM:** EXISTING PROPOSED
- **WATER SYSTEM TYPE:** WELL LAKE SPRING SHARED WATER SYSTEM COMMUNITY WATER SYSTEM
- **WATER SOFTENER/TREATMENT UNIT(S) IN USE OR PROPOSING TO INSTALL:** YES NO

BACKWASH FROM WATER SOFTENERS MUST BE PROPERLY DISPOSED OF IN A SEPARATE TRENCH.

OWNER/AGENT AUTHORIZATION

I HEREBY DECLARE THAT THE INFORMATION SUBMITTED HEREIN IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT AN INSTALLATION PERMIT MUST BE ISSUED BEFORE ANY SYSTEM COMPONENTS ARE INSTALLED, UNLESS OTHERWISE AUTHORIZED, AND THAT A FINAL INSPECTION AND AUTHORIZED APPROVAL OF THE SYSTEM MUST BE CONDUCTED BY LAKE COUNTY ENVIRONMENTAL HEALTH PRIOR TO BACK FILLING AND USE OF THE WWTS.

FOR ANY ALTERATION TYPE: I ACKNOWLEDGE THAT, IF I AM INCREASING WASTEWATER FLOW OR STRENGTH TO AN EXISTING WASTEWATER TREATMENT SYSTEM, IT MAY CAUSE THE SYSTEM TO FAIL PREMATURELY. I ALSO UNDERSTAND THAT BECAUSE OF THE ADDITIONAL FLOW OR STRENGTH OF WASTEWATER, THE SEPTIC TANK SHOULD BE CHECKED A MINIMUM OF EVERY THREE (3) YEARS AND PUMPED IF NECESSARY.

MY SIGNATURE ALSO AUTHORIZES ACCESS TO THE DESCRIBED PROPERTY FOR PURPOSES OF REVIEWING THIS APPLICATION.

PROPERTY OWNER(S)/AGENT SIGNATURE(S): _____

DATE: _____

IF AGENT, WRITTEN AUTHORIZATION FROM THE OWNER AND/OR LEGAL REPRESENTATIVE MUST BE RECEIVED BY LCEH BEFORE THE APPLICATION CAN BE PROCESSED.

DISCLAIMER

AS CITED UNDER SECTIONS 3.2-4.2 OF THE LAKE COUNTY WWTS REGULATIONS:

- *SECTION 3.2 (C), NO PERSON MAY INSTALL/ALTER THE WWTS CONTRARY TO WHAT THIS PERMIT IS APPROVED FOR. APPROVAL MUST FIRST BE GRANTED FROM THE CONTRACTED DESIGNER AND/OR LAKE COUNTY ENVIRONMENTAL HEALTH (LCEH) TO ALTER THE WWTS.*
- *SECTION 3.5, THIS PERMIT IS VALID FOR ONLY 24 MONTHS FROM THE DATE OF ISSUANCE. HOMEOWNERS MAY HAVE THE ABILITY TO EXTEND THE PERMIT'S APPROVAL FOR AN ADDITIONAL 12 MORE MONTHS UPON CONSULTING WITH LCEH.*
- *SECTION 4.2 (C), ANY **PROPOSED WELLS** INSTALLED AFTER THE DATE OF ISSUANCE OF THIS WWTS PERMIT SHALL MEET THE MINIMUM SETBACK DISTANCE REQUIREMENTS AS IDENTIFIED BY A.R.M. 17.36.918. ANY INSTALLED WELL THAT CONFLICTS WITH THE MINIMUM SETBACK DISTANCES, IS IN VIOLATION AND MAY BE REQUIRED TO BE ABANDONED.*
- *SECTION 4.2 (L), ALL WATER SOFTENER DISCHARGE SHALL BE EXCLUDED FROM THIS WWTS, AND SHALL BE DISPOSED OF IN A MANNER THAT WILL NOT AFFECT THE WWTS.*

LAKE COUNTY WASTEWATER TREATMENT SYSTEM (WWTS) PERMIT

OFFICE USE ONLY

Documents Required: **(Circle)** Level II Guest House Easement Shared Affidavit Other None

Document Notes: _____

_____

Sanitation Approval: **(Circle)** Required Not Required Completed ES# _____

Design Flow - Number of Bedrooms: _____

Gallons Per Day: _____ Septic Tank: _____

Application Rate: _____ Soil Type: _____

Pump Specs: _____

Level II System Required? **(Circle)** Yes No If yes, explain: _____

_____

Other septic permits related to this parcel: _____

Sanitation Approval: _____

_____

_____

_____

_____

_____

_____ **Sanitarian Initials:** _____

Planning Approval: _____

_____

_____

_____

_____

_____

_____ **Planner Initials:** _____

_____ _____ _____

Signature of Registered Sanitarian **Date of Issue** **Permit #**

- **This WWTS installation permit is good for 24 months after the date of issuance. It will expire on _____ .**
- **If the WWTS has not been installed prior to the expiration date noted, please contact LCEH at 406-883-7236 to see if the permit can be extended for an additional 12 months.**

Vacation Rental Approval _____

Signature of Registered Sanitarian **Date**

Lake County Planning and/or Environmental Health Department
Authorized Agent Statement by Property Owner(s)

~ ~ ~

This document, or similar document or letter with original signature(s)*, must be signed by all owners named on the most recent property deed or by all authorized signator(s) for any property owned by a trust, LLC or similar entity.

I (we), _____, the undersigned owner(s) or authorized signator(s) of property legally described as:

_____

_____

_____

_____

hereby agree to allow my (our) agent _____ to sign a Lake County Environmental Health Department and/or Planning Department Application for purposes related to the development of the above-described parcel of land.

_____

Property Owner/Authorized Signator Date

_____

Property Owner/Authorized Signator Date

_____

Property Owner/Authorized Signator Date

_____

Property Owner/Authorized Signator Date

CHECKLIST FOR:

LAKE COUNTY
LAKESHORE CONSTRUCTION PERMIT APPLICATION

This checklist is to assure your application is complete so it can be processed promptly. Please use the check boxes next to each item. You will be notified within 5 working days if any key elements are missing. Be reminded that additional information may be required as the application goes through the review process.

You are welcome to schedule an **Informal Project Preview** with the Planning Department staff prior to submitting an application. This is a free service to ensure projects go as smoothly as possible from the beginning. We are more than happy to discuss your project and provide feedback!

Submit the checklist, application and fee to:

Lake County Planning Department
106 4th Avenue East
Polson MT 59860

Phone 406.883.7235
FAX 406.883.7205
Email planning@lakemt.gov

Please check that you have completed the following:

- ☐ Check to Lake County Planning Department
- ☐ Landowner Contact Information
- ☐ Local Agent/Contractor Contact Information
- ☐ Correspondences to be sent to 1) Applicant or 2) Local Agent/Contractor (check box on form)
- ☐ Supplemental Authorization from Landowner (if applicable)
- ☐ Project Location/Description
- ☐ Location Sketch
- ☐ Property / Proposal Description
- ☐ Project Cost – provide a written bid from contractor or materials bid if the owner is doing work
- ☐ Detailed Site Plan
- ☐ Cross-sectional View
- ☐ Other Required Permits? (Tribal, Floodplain, etc.)
- ☐ Property Staking (stake improvements and side property lines)
- ☐ Landowner/Agent Certification and Signature(s)

See the department webpage for regulations and other information:
www.lakemt.gov/planning/planning.html

Tip: Plan for at least four (4) weeks of review time before permit is issued. Hopefully, you will get your permit sooner, but four weeks is a good estimate of what to plan for.

Lake County Planning Department
106 Fourth Avenue East
Polson, MT 59860-2175
Phone: (406) 883-7235
Fax: (406) 883-7205

PLANNING DEPARTMENT USE ONLY:	
PERMIT APPLICATION #	
DATE(S) OF SITE VISIT(S):	
DATE PERMIT ISSUED:	
ADMINISTERED BY (PLANNER):	

LAKESHORE CONSTRUCTION PERMIT APPLICATION

This form must be used for any project occurring within the Lakeshore Protection Zone as defined within the Lakeshore Protection Regulations adopted by Lake County. **Attach a check covering the appropriate fees from the table below payable to LAKE COUNTY PLANNING DEPARTMENT and mail the application materials to the address above.**

Application for permit **Cost of project:** **$0 - $500** **$500 - $5000** **$5000 - $10,000** **$10,000 - $25,000** **$25,000 - $50,000** **$50,000 +**	**FEE:** **$ 75** **$150** **$250** **$425** **$575** **$600**
Application for a Variance – Minor	**Fee as above plus $300**
Application for a Variance – Major	**Fee as above plus $400**
Extension of an existing permit	**$ 25**
Changes to a permit with no site visit necessary	**$ 50**
Revisit the site if requested or necessary to review changes to a permit	**$100**
Site plan review or site visit for administrative determination	**$100 (counts towards future permit fee)**
Permit extension	**$ 25**
After-the-fact Permit	**Fee as above multiplied by 2**

I, _____the undersigned landowner/agent, have read and understand the current Lakeshore Protection Regulations for Lake County that apply to the subject property. By completing and signing this application form, I certify that all work required to complete the proposed development will be done in compliance with the requirements of the Lakeshore Protection Regulations, as well as all applicable regulations of Lake County and the State of Montana. Furthermore, I hereby grant permission to the members of the Lake County Planning staff, the Board of Lake County Commissioners, and their designated agents to enter onto the subject property for the purposes of evaluating this application and any construction or modification of the site that will occur as a result of this application.

(Landowner/Agent: Check the box next to each item below to demonstrate completion of the item. If an item is not applicable to your proposal include N/A next to the box to indicate it is not required for your proposal.)

☐ **1. Landowner Contact Information:**
Name of Landowner: _____

Mailing Address: _____
City: _____ State: _____ Zip Code: _____
Phone:_____ Email: _____

☐ **2. Local Agent/Contractor Contact Information (if applicable)*:**
Name of Agent/Contractor: _____
Mailing Address: _____
City: _____ State: _____ Zip Code: _____
Phone:_____ Email: _____
Note: If more than one agent/contractor is being used, attach a sheet containing the additional information.

☐ **3. Correspondence:**
The original Lakeshore Construction Permit to be posted at the project site, and other correspondences should be sent to: 1) Applicant ____ *or* 2) Local Agent/Contractor____ (check one)
Note: A copy of the approved permit and other primary correspondence will be sent to the other party.

☐ **4. Authorization from Landowner (if applicable):**
If the person signing the application is not the current landowner of the property where the project will occur, attach a letter to this application from the landowner authorizing the agent/contractor to act on the landowner's behalf in matters related to this proposal including all understandings, certifications and representations made pursuant to this application.

☐ **5. Project Location/Description:**

Legal Description: _____

Subdivision/COS/other: _____ Lot: _____ Block: _____

Section ____, Township ____North, Range ____West

Tax ID Number: _____ Geocode: _____

Zoning District: _____ Subunit: _____

Linear Feet Lakeshore Frontage: _____

☐ **6. Location Sketch:**
Attach a location sketch that is adequate to locate the property for a site visit. The sketch should identify such items as road signs, landmarks or other features to assist in locating the project site.

☐ **7. Current Property / Proposal Description:**

☐ What is the use of the property? Residential /Commercial /Agricultural /Other_____
(Circle all that apply)

☐ Are there any restrictive covenants, deed restrictions, private use or maintenance agreements, easements or similar encumbrances associated with the property? Yes ___* No ___
***If yes**, attach copies or provide document numbers.**

☐ Describe the proposed project:

_____

_____

_____

☐ Specify major construction materials (lumber, concrete, stone, etc.) to be used:
_____

_____

_____

☐ Specify equipment to be used (if applicable):_____

_____

_____

☐ Specify erosion control measures to be used:_____

_____

_____

☐ **8. Project Cost:**
Attach a bid for the project written by a contractor. If the homeowner is doing the work themselves, attach a cost of materials bid from the materials source.

☐ **9. Detailed Site Plan:**
Attach a site plan (the preferred scale is 1 inch to 20 feet) to demonstrate that the proposed project complies with the Lakeshore Protection Regulations. Check the box for each item that has been included on the site plan.

- ☐ Location of the mean annual high water elevation
- ☐ Location of mean annual low water elevation
- ☐ Location of the 20' lakeshore strip of the Lakeshore Protection Zone (the 20' land area) and any nearby wetlands or streams
- ☐ Location and dimension of any portion of the Lakeshore Protection Zone with slopes of 25% or greater
- ☐ Location and principle dimensions of the project, including lengths and widths
- ☐ Location/distance to side property lines and/or riparian boundary lines
- ☐ Location and dimensions of all existing and proposed lakeshore facilities
- ☐ Location of existing or proposed utilities, including water and electric lines
- ☐ Location and dimension of deposit area for construction waste
- ☐ Estimated amount of dredge or fill materials, and location/dimension of deposit area for dredged materials
- ☐ Location of planned best management practices (BMPs), such as silt fences, straw bales, wattles, etc.
- ☐ Existing and proposed vegetation, along with indication of what vegetation is to be removed and/or preserved
- ☐ Scale
- ☐ North Arrow

☐ **10. Cross-sectional View:**
Attach a cross-sectional view of the proposed improvement(s) that shows the elevation of the existing and proposed (finished) grades to allow the Lakeshore Administrator to calculate the height of the improvement(s). The cross-sectional view must show:

- ☐ Mean annual high water elevation
- ☐ Mean annual low water elevation
- ☐ Height/elevation of project relative to the mean and low annual high water elevations
- ☐ Depth of footings, dimensions of any excavation, and/or depth of any fill materials
- ☐ Planned best management practices (BMPs), such as silt fences, straw bales, wattles, etc.

☐ **11. Other Required Permits:**

- ☐ Have you applied for a Tribal permit? Yes _____ No _____ Not applicable _____
- ☐ Are there any other permits required to complete the project? Yes _____ No _____
  If yes, include the name of each permitting agency and the type of permit(s) required below and include a copy of the permit(s) or application(s) with this application.

  _____

  _____

  _____

☐ **12. Property Staking:**
The applicant shall stake the location of any proposed improvement(s) and side property line locations prior to submitting this application to the Lake County Planning Department for review.

☐ **13. Landowner/Agent Certification:**
By affixing my signature hereto, I certify that the information furnished herein is true and correct to the best of my knowledge, and that I am the owner of the premises where the work is to be performed or I am acting as the owner's authorized agent. I understand that the permit issued pursuant to these regulations strictly limits construction to authorized plans on file with Lake County and to all conditions of approval attached to the permit. Any changes to the proposed construction, including additional construction, would require additional review and approval by Lake County. I further understand that construction shall not commence on the proposed project until the application has been approved, the permit has been issued by Lake County, and the permit has been posted within twenty feet (20') of the project work site in plain view.

_____ _____

Landowner or Designated Agent Signature ***Date***

Incomplete or erroneous applications will be returned to the applicant

When determining a timeline for your project, be aware that a permit will typically be issued within four (4) weeks of a complete application being received by the Planning Department if the proposed use and site plans conform to the standards of the Lakeshore Protection Regulations. Following submittal of this application and attached materials, any additional information the Lakeshore Administrator requests to review this proposal must be submitted within 6 months from the date of the original date of the received Lakeshore Construction Application or the applicant may be required to re-apply for a permit.

All permits issued as a result of this application shall be good for a construction period of one year. If it is determined that the landowner is diligently working towards project completion and submits the applicable extension fee, a one-year extension may be issued.

Revision #3 2/17/21

The Confederated Salish & Kootenai Tribes
Of the Flathead Nation
SHORELINE PROTECTION OFFICE
P.O. Box 278, Pablo, MT 59855
(406) 883-2888-EXT. 7212
FAX (406) 883-2895
E-Mail James.Westerman@cskt.org

64A (Revised)

Application No:_____ Date Received:_____
CORPS No: _____ Rights Protection No:_____

THIS APPLICATION MUST BE COMPLETE BEFORE THE PROPOSED PROJECT CAN BE REVIEWED. AN APPROVED PERMIT MUST BE OBTAINED BEFORE BEGINNING WORK.
This application does not eliminate the requirement that you obtain any other applicable Federal or local permits.

Type of work requesting permit for: (check all apply)

O New O Existing O Repair O Shore station O Rip Rap O Retaining wall
O Buoy O Rail system O Waterline O Dock O Boat ramp O Other

Is your Annual Administrative fee current: O Yes O No
(Permit will be denied until fees are current.)

1. OWNER IS:

Name_____
Mailing Address_____
_____
Physical Address:_____
_____
Phone No:_____

APPLICANT IS:

Name_____
Address _____
_____

Legal description of project site: Township:_____Range: _____Section:_____

Block No: _____Lot No:_____Villa Site:_____(Copy of plat is desired)

Lakeshore Frontage_____Feet?

O Fee status (non Tribal) O Trust status (Tribal owned)

Are you aware of any historic or cultural sites of artifacts in proposed construction area? O Yes O No

Contractor or person doing the work other than the Applicant/Owner is:

Name_____ Name_____
Contractor Previous owner if acquired in last 5yrs
Address _____ Address _____
_____ _____
Phone No:_____ Phone No:_____

DRAWINGS FOR ITEMS 1 - 6 BELOW MUST BE SUBMITTED WITH THIS APPLICATION.
See the attached examples.

1. Existing structures in place below MAHWM on the site:_____
_____

Date Constructed: _____

2. Nature of proposed work:_____
_____
_____

3. Beginning date of the proposed work is _____Completion date_____

4. Type of repairs: Stringers #'s:_____pilings #s: _____decking _____

(**Standard Structure is not to exceed 800 sq. ft. per landowner, 1000 sq. ft. per. joint ownership**.)
Variance is required thereafter.

5. Project dimensions for dock: Width _____Length _____ Water Depth_____
(8' max) (60' max) (5' max)

Height/Elevation of dock above water_____

The dock and dock wing only be used to provide boat moorage, access to moorage area, or swimming,
A 3D rendering of the dock, with MAHWM indicated on the 3D rendering must be provided with application

A. Dimension of wing if applies: Width _____(8' max) Length_____(30' max)

B. **Distance from LEFT riparian line**_____ft: **Distance from RIGHT riparian line**_____

(**Private or joint ownership structures, 25' minimum from each riparian line**)
(**Marina or common use structures, 100' minimum from each riparian lin**e)

C. Placement of: O Shore station O Personal watercraft lift

D. **Distance from LEFT riparian line** _____ft.: **Distance from RIGHT riparian line**_____

E. Buoy distance from riparian lines _____**left** _____**right.** Distance from Shore**:** _____
(Must not exceed 100' lake ward.)

F. Dimension of retaining wall if applies: Width_____Length _____Height_____

G. Type: O rock O wood O concrete O other

Retaining wall must not exceed (2893.20) MAHWM.

6. Will equipment be required to enter the lakebed? O Yes O No

A. If yes, please describe routes of entry and exit and frequency:_____

7. Equipment and vehicles other than hand tools to be used:_____

_____

8. Will project require placing of riprap? O Yes O No

Size:_____Quantity:_____Source: _____

Length:_____ft., Width:_____ft., Height: _____ft.

9. Do you use the lake/river for domestic/home use: O Yes O No
10. For irrigation? O Yes O No

11. Has any agency denied approval for activity described herein or for any activity related to the activity described herein? O Yes O No

If yes, what agency and why? _____

12. Have you received any Notice of Non-Compliance or similar correspondence? O Yes O No

If yes, why?_____

_____

Names, address of adjoining property landowners, lessee etc: (Viewing from property to the lake)

(LEFT) (RIGHT)

Name:_____ Name: _____

Address:_____ Address: _____

_____ _____

Phone Number:_____ Phone Number:_____

The applicant certifies that the statements appearing herein are to the best of his/hers knowledge, true and correct, and hereby authorizes the inspection of the proposed project site by the Shoreline Protection Office

_____ _____

OWNER'S SIGNATURE (if not the applicant) **DATE**

_____ _____

APPLICANT'S SIGNATURE **DATE**

If the applicant is not the owner, then the owner granting permission to the applicant for the work proposed and described in the application must sign the application. Should any construction exceed permit conditions authorized on Permit, the landowner may be responsible for such construction.

Is your application complete? Incomplete applications will be returned for completion.

- ✓ ***Has the owner signed the application?***
- ✓ ***Did you include a drawing of your proposal?***
- ✓ ***Did you include your application fee?***

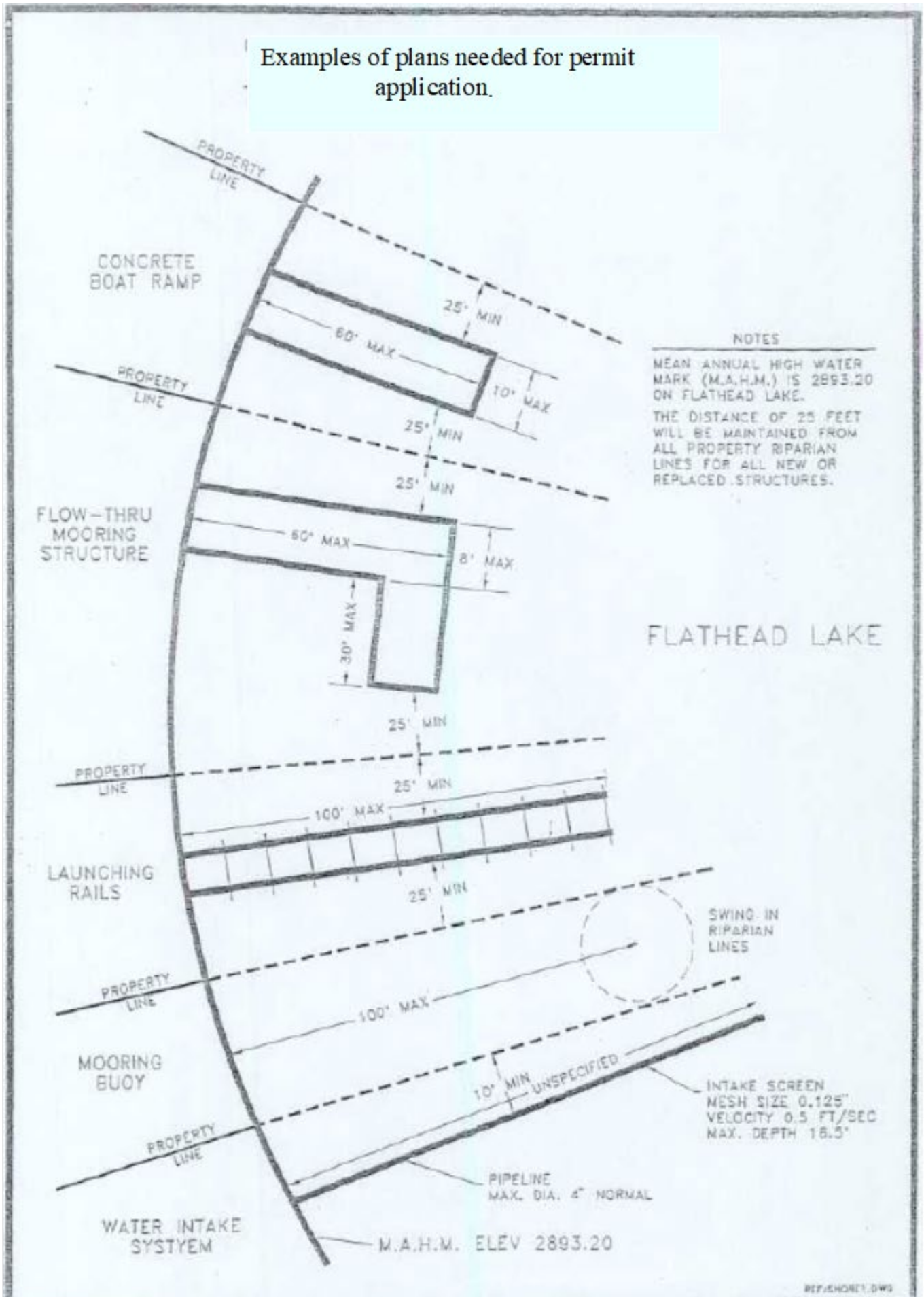
SHORELINE PROTECTION BOARD FEE SCHEDULE

*MEAN ANNUAL HIGH WATER MARK (MAHWN) ELEVATION 2893.20 FEET.

STRUCTURE TYPE	APPLICATION FEES/ANNUAL PERMIT FEES
Docks, Wharves, Piers Breakwater, Jetties, Groins	$50 app. fee + assessed an annual fee of $.25 per sq ft measured after completion (surface area from MA
Retaining walls, (concrete)	$50 app. fee + $500 one time fee
Rip-rap/wood retaining walls	$50 app. fee + $100 one time fee
Boat Rail System	$50 app. fee + $1.00 per lineal ft. one time fee
Shore stations	$50 app. fee + $50 one time fee
Waterlines/water withdrawal Systems,	$50 app. fee + $1.00 per lineal ft. one time fee
Buoys	$50 app. fee + $50 annual (No fee if marking a hazard to navigation.)
Removal of Gravel, silt	$50 app. fee. Application must be submitted.
Public or Educational	NO CHARGE. Application must be submitted.
Permit extensions	$50 per extension
Request for minor variance	$50 app. fee + $200 one time (non-refundable) + $.25 sq ft annual fee if the surface area over 800 sq ft for 100' of shoreline then annual fee of $.50 per sq ft.
Common use dock	$50 app. fee + $500 onetime fee + assessed an annual fee of $.25 sq ft measured after completion
Marina	$50 app. fee + $1000 onetime fee + assessed an annual fee $.60 sq ft. measured after completion
Other projects	will be examined by staff to determine compliance with Ordinance and Regulations, Then presented to the Board With recommendations.

The Shoreline Board and staff must review and judge each structure separately, due to unique surroundings terrain and ecology; therefore, each application must be filled out as completely as possible.

Examples of plans needed for permit application.

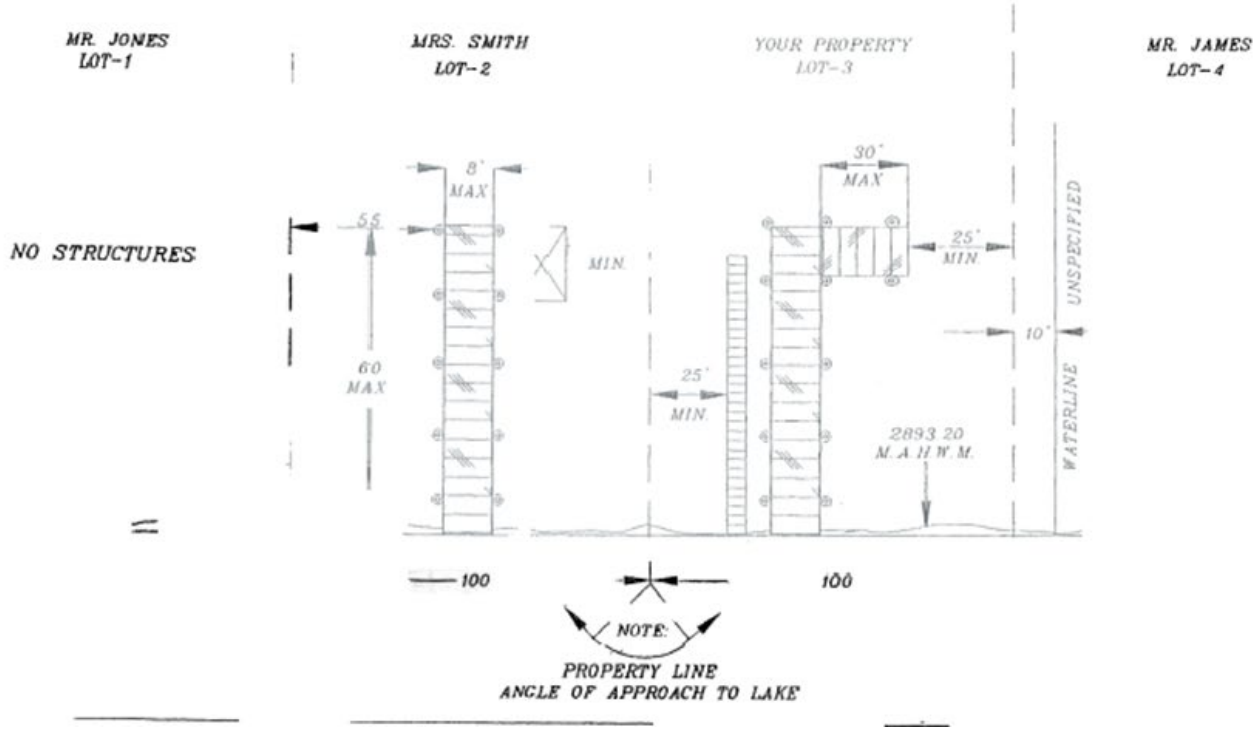


THE PURPOSE OF THE SITE PLANS IS TO IDENTIFY THE LOCATION OF THE PROPOSED PROJECT AND ANY EXISTING STRUCTURE/FACILITIES IN THEIR RELATION TO THE APPLICANT'S PROPERTY LINES AND TO THE JURISDICTIONAL RIPARIAN BOUNDARIES AS RELATED TO THE SHORELINE PROTECTION RULES AND REGULATIONS. AND ONLY THESE STRUCTURES WHICH ARE LOCATED BELOW THE MEAN ANNUAL HIGH WATER MARK (M.A.H.W.M.) ELEVATION (2893.2).

A. DIMENSIONS OF THE PROPERTY ON WHICH OR IN CONJUNCTION WITH THE PROPOSED PROJECT.

B. LOCATION OF THE PROJECT OF THE PROPERTY IN RELATION TO THE M.A.H.W.M. ELEVATION OF 2893.2. ALL MEASUREMENTS PERTINENT TO PROPERTY LINES AND LAKESHORE MUST BE INDICATED.

C. MUST INDICATE NAVIGABLE WATER DEPTH (5 FEET) IN RELATION TO EXISTING OR PROPOSED STRUCTURE (NEW CONSTRUCTION).



Question for administrative use only

a. Will this project have the minimum required flow-through necessary to prevent gravel build up and algae growth? O Yes O No

b. Do you feel this project will have an effect on water quality? O Yes O No

c. Do you feel this project will diminish habitat for fish & wildlife? O Yes O No

d. Do you feel this project will interfere with navigation or other lawful recreation? O Yes O No

e. Do you feel this project will create a public nuisance? O Yes O No

f. Do you feel this project will create a visual impact inconsistent with the natural scenic? Values of the area? O Yes O No

g. Do you feel this project significantly alters the characteristics of the area? O Yes O No

h. Do you feel this project will cause increased sedimentation in the waterway? O Yes O No

i. Do you feel this project will cause increased discharges of nutrients or toxic substances to the waterway? O Yes O No

APPENDIX C

Geotechnical Report

PIONEER TECHNICAL SERVICES, INC.

RESTORING OUR ENVIRONMENT ● DESIGNING OUR FUTURE

Flathead Bio Station Geotechnical Report

Helena, Montana

Prepared for:

Anderson-Montgomery Consulting Engineers

1064 N. Warren Street

Helena, Montana 59601

Prepared by:

Pioneer Technical Services, Inc.

1309 Cole Street

Helena, Montana 59601

December 2022

Table of Contents

List of Figures

List of Tables

List of Appendices

Revision No.	Author	Version	Description	Date
Rev 0	Sean Harris	Draft	Internal Review	December 2022
Rev 1	Mike Browne	Final	Client Submittal	December 16, 2022
Rev 2				

1 INTRODUCTION

Anderson-Montgomery Consulting Engineers (Anderson-Montgomery) contracted Pioneer Technical Services, Inc. (Pioneer) to complete a geotechnical investigation for proposed wastewater treatment plant (WWTP) and lift station, at Yellow Bay on Flathead Lake, Montana. As the design progressed, the need for the lift station was eliminated and it was removed from the project and underground storage tanks were added to the project.

The purpose of the geotechnical investigation was to explore subsurface conditions at the site and provide information on soil characteristics, foundation recommendations, soil bearing capacity, lateral earth loads, concrete flatwork recommendations, soil corrosivity concerns, seismic zone, groundwater conditions, percolation test results, material specifications, and discussion of any unusual conditions. This report provides conclusions of the investigation, results of laboratory testing and analyses, and design recommendations.

2 INVESTIGATION

2.1 Site Description

The property is a designated biological research facility located within Yellow Bay State Park on Flathead Lake, Montana. Overall, the site grades downward from north to south. It is bound by private property to the north, Highway 35 to the east, and Flathead Lake to the south and west. The legal description of the site is the Northwest ¼ of the Northeast ¼ of Section 04, Township 24 North, Range 19 West.

2.2 Geotechnical Investigation

Pioneer drilled three boreholes (BH-01 through BH-03) to depths between 20 and 47.5 feet below the ground surface as shown on Figure 1. The drilling work was performed on August 8 and 9, 2022, by Boland Drilling under subcontract to Pioneer. The boreholes were advanced using a truck-mounted drill rig using a hollow stem auger system. An engineer from Pioneer logged the borehole lithology and collected samples for laboratory testing.

In-situ strengths were collected via Standard Penetration Tests (SPTs) using a 2-inch outside diameter split-spoon sampler which was driven into the soil using a standard 140-pound safety hammer falling from a height of 30 inches. Geotechnical samples were collected from each SPT interval and field classified according to ASTM International D2488 (Standard Practice for Description and Identification of Soils [Visual – Manual Procedure]).

Appendix A contains the detailed borehole logs and Appendix B presents photographs of the investigation and soil samples. The stratification lines shown on the borehole logs represent the approximate boundary between soil types as observed within the boreholes. The actual *in-situ* transition is variable because of the nature and depositional characteristics of natural soil.

Interpolation of subsurface conditions beyond the location of the boreholes may be unreliable as soil conditions can change rapidly in both lateral and vertical directions.

2.2.1 Soil Lithology

Geologically the site is in quaternary glacial till deposits (*unsorted angular to rounded clay-boulder sized sediments*) (MBMG, et al., 2010). This was consistent with the exploration as a range of materials were encountered including rounded cobbles and clays.

2.2.2 Groundwater Conditions

Groundwater was encountered at the time of drilling between 13 and 20 feet below ground surface. Groundwater likely varies seasonally and could be encountered during construction of the underground storage tanks. Contractor is encouraged to have an approved dewatering plan prior to construction.

2.3 Laboratory Testing

All collected samples were transported and analyzed at Pioneer's materials testing laboratory located in Helena, Montana. The samples were collected from select depths and were tested for their index (physical) and chemical properties.

2.3.1 Index Properties

A summary of the laboratory testing results is presented in Table 1. Appendix C provides the complete laboratory testing results.

Table 1: Laboratory Index Data

TEST HOLE NO.	DEPTH (ft)	WATER CONTENT (percent)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRADATION ANALYSIS			USCS* SYMBOL	CONSOLIDATION TEST		
								GRAVEL (%)	SAND (%)	FINES (%)		INITIAL VOID RATIO	COMPRESSION INDEX C_c	RE-COMPRESSION INDEX C_r
BH-01	10-12	62.1	62.1	2.7	55	22	33	5	10	85	CL	1.844	0.266	0.033
BH-02	10-11.5	-	-	2.7	41	22	19	4	8	88	CL	-	-	-
BH-03	15-17	32.8	87.2	2.7	29	11	11	0	0	100	CH	1.012	0.648	0.116

*USCS: Unified Soil Classification System.

Moisture contents ranged from 3% to 27% with an average moisture content of 17%.

2.3.2 Chemical Properties

Corrosivity testing (soluble sulfate, pH, and resistivity) was conducted to determine if the native soil may potentially be corrosive to buried concrete or metal associated with the proposed construction. The pH and soluble sulfate testing were subcontracted to Alpine Analytical, Inc. located in Helena, Montana. A summary of corrosivity testing results is presented in Table 2.

Table 2: Corrosivity Testing

BORE HOLE NO.	DEPTH (feet)	pH (s.u.)	RESISTIVITY (ohm-cm)	SOLUBLE SULFATE (%)
BH-02	0-10	7.66	3,600	0.0034

ohm-cm: ohm-centimeter. s.u.: Standard Unit.

Criteria from the American Water Works Association and by the Portland Cement Association (PCA) were used to evaluate soil corrosiveness. The PCA criteria for concrete exposed to sulfate-containing soil (PCA, 2007) are listed in Table 3.

Table 3: PCA Concrete Sulfate Exposure Criteria

SULFATE (SO_4) CONTENT IN SOIL (%)	SULFATE EXPOSURE	RECOMMENDED CEMENT TYPE	MAXIMUM WATER/CEMENT RATIO
Less than 0.10	Negligible	No special type required	--
0.10 to 0.20	Moderate	Type II cement	0.50
0.20 to 2.00	Severe	Type V cement	0.45
Over 2.00	Very Severe	Type V cement plus pozzolan or slag	0.40

The native site soil is not considered corrosive to buried metallic elements. The sulfate testing results indicate the on-site soil has a negligible exposure to concrete sulfate attack. Type I or Type I/II cements are acceptable for all cast-in-place structural concrete exposed to the native soil.

3 ANALYSES AND RECOMMENDATIONS

3.1 Proposed Construction

The proposed construction includes the following:

- A modular WWTP is approximately 16 feet wide and 50 feet long. The WWTP is constructed within steel containers, similar to shipping containers, that will be set on top of existing ground surface. The manufacture calls for the WWTP to be founded on a gravel pad and will have exterior concrete aprons at door locations. WWTP specifics are listed in Appendix E summarized below:
    - The tank side and treatment side of the WWTP weigh approximately 100,000 pounds and 30,000 pounds, respectively.
    - The tank side will be heavier and is anticipated to have an imposed ground pressure of 312 pounds per square foot (psf).
- Two buried concrete tanks outside the WWTP footprint consisting of the following:
    - 6,000-gallon EQ tank that has a footprint of 18 feet by 9 feet and weighs 71,200 pounds when full. Using these dimensions and weight, the tank will have an imposed ground pressure of approximately 440 psf.

- 27,000-gallon sludge holding tank that has a footprint of 18 feet by 24 feet and weighs 310,000 pounds when full. Using these dimensions and weight, the tank will have an implied ground pressure of approximately 720 psf.

3.2 Subsurface Materials Discussion

For the proposed water treatment plant, the native soil is primarily made up of coarse-grained, sand and gravel in the upper 7.5 feet (BH-02) to 13.0 feet (BH-03) of the site lithology where it grades into very soft to soft clay.

3.2.1 WWTP

The native sands and gravels will provide good support to the proposed modular water treatment plant. The underlying clay is prone to long term settlement from the imposed WWTP loads.

Settlement analysis for the WWTP was performed for primary consolidation based on laboratory consolidation testing, an anticipated implied surface load of 312 psf, and clay encountered at a depth of 7.5 feet. Anticipated settlement was estimated at less than 1 inch, with differential settlement estimated at less than ½ inch. Settlement calculations for BH-02 (clay at 7.5-foot depth) and BH-03 (Clay at 13.0-foot depth) are presented in Figures 2 and 3, respectively.

Swell/collapse potential was also evaluated during the consolidation testing by saturating the samples during the consolidation process. Upon saturation, one of the samples exhibited a small degree of collapse while the other sampled exhibited a small degree of swell. In Pioneer's opinion, this degree of swell and collapse are acceptable and within the settlement estimates discussed above.

3.2.2 Buried Tanks

Pioneer is unaware of the height of the buried tanks or the depths they will be buried. There is a chance the bottom of the buried tanks will be positioned in the very soft, to soft clays logged at a depth of 7.5 feet and 13.0 feet in BH-02 and BH-03, respectively. Settlement is not anticipated at the tank locations due to the full tanks having a smaller imposed pressure than the *in-situ* soil stress.

3.3 WWTP Gravel Pad Foundation

For a gravel pad foundation, Pioneer recommends the following:

1. Excavate and remove surficial topsoil beneath the gravel pad footprint to design elevation.
2. Provide an opportunity for the engineer to inspect the bottom of the excavation. Excavate soft spots or unsatisfactory materials that are observed.
3. Moisture condition subgrade soils to plus or minus 2% of optimum moisture content. Compact the subgrade soils to a standard relative compaction (ASTM D698) of at least 98%.

   i. Compacted excavation surface should be proof-rolled with heavy equipment. Engineer should be allowed to observe proof-rolling to approve compacted surface.
4. Place and compact structural fill to design grade. Place gravel fill in 8-inch (maximum) loose lifts and compact to a standard relative compaction of at least 98%. Structural fill should meet the gradation requirements listed in Table 4.

Table 4: Structural Fill
(MPW 1.5-inch Minus Base Course)

SIEVE SIZE	PERCENT PASSING
1.5 - inch	100
No. 4	25 - 60
No. 200	0 - 8

Ensure there is positive drainage away from the open excavation to keep all surface water from draining into the excavation. This recommendation also applies to final grading, where positive drainage must be in place around the entire gravel pad perimeter.

3.4 Buried Tanks

Site soils are suitable to support the proposed concrete tanks.

If the bottom of the tank is positioned in native granular soils, Pioneer recommends the following:

1) Excavate to design grade. Dewater if warranted.
2) Provide an opportunity for the engineer to inspect the bottom of the excavation. Excavate soft spots or unsatisfactory materials that are observed.
3) Moisture condition subgrade soils to plus or minus 2% of optimum moisture content. Compact the subgrade soils to a standard relative compaction (ASTM D698) of at least 95%.
4) Set the tank.

If the bottom of the tank is in the very soft to soft clay, Pioneer recommends over-excavating below the structure bottom and stabilizing subgrade soil using a combination of imported aggregate and geosynthetics. These recommendations are intended to improve constructability and provide a dense, uniform-bearing surface for the precast tank(s). Specific recommendations include the following:

1) Dewater the site as required for construction. Pioneer recommends that the contractor provide an approved dewatering plan prior to initiating construction.
2) Excavate and remove soil to 18 inches below the bottom of the precast tank. Horizontally, the excavation should be extended 2 feet beyond the perimeter.
3) Compact subgrade by one of the following methods:
   a. If soil and moisture conditions allow, moisture condition the subgrade soil to plus or minus 2% of optimum moisture content and compact subgrade to a standard relative compaction (ASTM D698) of at least 90%.

b. If subgrade soil is saturated and prone to pumping, compact subgrade with a minimum of four passes of a sheep's foot roller. Do not use vibratory compaction. Discontinue compaction if the process is drawing water upward or causing pumping. Density testing is not required.

4) Place Propex Geotex 801 nonwoven geotextile (or engineer approved equivalent) across the compacted surface. Place Tensar BX1200 biaxial geogrid (or engineer approved equivalent) on top of the woven geotextile. The geosynthetics should be installed in accordance with manufacturer's recommendations.
5) Place 12 inches of rockfill over the geosynthetics. Compact with a minimum four passes using compaction or tracked equipment. With engineer approval, bucket compaction is acceptable alternative to any location equipment cannot safely access. Rockfill should meet the gradation requirements listed in Table 5.
6) Place Propex Geotex 801 nonwoven geotextile across the compacted rockfill surface. Install in accordance with manufacturer's recommendations.
7) Place structural fill to design elevation. Place in 8-inch (maximum) loose lifts and compact each lift to a standard relative compaction of at least 95%. A ¾-inch minus crushed coarse concrete aggregate is an acceptable alternative to the structural fill.

Table 5: Rockfill (MDT Drain Aggregate)

SIEVE SIZE	PERCENT PASSING
6 - inch	100
¾ - inch	0 - 10
No. 4	0 - 5

3.5 Seismic Considerations

The seismic coefficients were estimated using ASCE7-16 and Risk Category II (ASCE7-16 is based on the 2018 International Building Code). The seismic coefficients values are presented in Table 6. The seismic coefficients data sheet is included in Appendix D.

Table 6: Seismic Coefficients

Site Class Definition	D
Seismic Design Category	D
Mapped Spectral Response Acceleration Parameter, S_S for 0.2 second	1.1g
Mapped Spectral Response Acceleration Parameter, S_1 for 1.0 second	0.31g
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{MS}	1.25g
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{M1}	0.76g
Design Spectral Response Acceleration Parameter, S_{DS}	0.84g
Design Spectral Response Acceleration Parameter, S_{D1}	0.51g

3.6 Underground Utilities and Trench Stability

For utility trench excavations, the trench soil meets the Occupational Safety and Health Administration's 29 CFR Part 1926 requirements for a Type C soil. The steepest unsupported slope within a Type C soil is set at 1.5H to 1V.

Use Type I bedding soil beneath and up to 6 inches above the top of the pipe. Type I bedding soil is ¾-inch minus granular soil having a soluble sulfate content less than 0.1% and a resistivity greater than 3,000 ohm-centimeters. The on-site soil can be reused as trench backfill above the bedding soil.

Soil compaction in utility trenches deeper than 5 feet should be performed using a remote trench compactor or a Felco-style bucket on an excavator and observed by an inspector. Perform compaction testing on each lift from a depth of 5 feet to the top of the trench. Place the trench soil in 8-inch (maximum) loose lifts and compact to a standard relative compaction of at least 95%.

4 EARTHWORK TESTING

Pioneer recommends that a qualified inspector perform compaction testing for subgrade, structural fill, base course, and backfill. Table 7 lists the suggested minimum compaction testing frequency.

Table 7: Compaction Testing Frequency

LOCATION	FREQUENCY
Beneath WWTP and Tanks	1 test per 400 square feet per lift
Backfill	1 test per 50 linear feet per lift
Exterior Concrete Flatwork	1 test per 1,000 square feet per lift or 1 test per 300 lineal feet per lift

Table 8 summarizes the material compaction specifications presented in other sections of this report. Compaction testing should be performed on subgrade, structural fill, and backfill. Frozen soil, ice particles, and soil with organics, debris, or deleterious materials are not suitable for use as fill. Appropriate winter construction techniques must be used, as warranted, to protect subgrade, fill, and cast concrete from frost. Fill cannot be placed on top of frozen soil. Maximum loose lift thickness is 8 inches.

Table 8: Required Relative Compaction

LOCATION	REQUIRED MINIMUM RELATIVE COMPACTION	STANDARD
Beneath WWTP	98%	ASTM D698
Beneath Buried Tanks	95%	ASTM D698
Backfill	95%	ASTM D698
Exterior Concrete Flatwork	95%	ASTM D698

5 BASIS OF RECOMMENDATIONS

The analyses and recommendations submitted in this report are based on the boreholes completed during the subsurface investigation and general site familiarity. Often, variations occur within the subgrade, the nature and extent of which do not become evident until additional

exploration or construction is conducted. Pioneer recommends geotechnical involvement be continued throughout the project to ascertain the recommendations presented herein (Geotechnical Report) have been properly interpreted both during design and construction. These services will reduce the potential for misinterpretation of geotechnical design recommendations. Pioneer also recommends a geotechnical engineer be notified during the foundation excavation construction phase to evaluate the foundation soil and verify its resemblance to those encountered during the site investigation.

This report is based on Pioneer's understanding of the preliminary design location associated with the proposed WWTP at Yellow Bay, Flathead Lake, Montana. If the locations or proposed elevation profiles change, please consult Pioneer to verify that these recommendations are still applicable.

This report is for the exclusive use of Anderson-Montgomery and their design team. In the absence of Pioneer's written approval, Pioneer makes no representation and assumes no responsibility to other parties regarding this report. The data, analyses, and recommendations may not be appropriate for other structures or purposes. Other parties contemplating other structures or purposes should contact Pioneer.

Services performed by Pioneer's personnel for this project have been conducted with the level of care and skill ordinarily exercised by members of the profession currently practicing in this area under similar budget and time restraints. No warranty, expressed or implied, is made.

Professional Certification

I hereby certify that this report was prepared by me and that I am a duly Licensed Professional Engineer under the laws of the State of Montana.

Michael Browne, P.E.
Project Geotechnical Engineer

Sean Harris, E.I.
Staff Geotechnical Engineer

6 REFERENCES

MBMG, 2020. McDonald C., Mosolf J.G., Vuke S.M., Lonn J.D., 2020, Geologic map of the Elliston 30’ x 60' quadrangle, West-Central Montana: Montana Bureau of Mines and Geology Geologic Map 77.

PCA, 2007. Concrete Technology, Effects of Substances on Concrete and Guide to Protective Treatments.

FIGURES

Figure 1. Borehole Locations

BOREHOLE LOCATION MARKER

N

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: International Feet
SOURCE: Pioneer

SCALE IN FEET
0 15 30

FIGURE 1

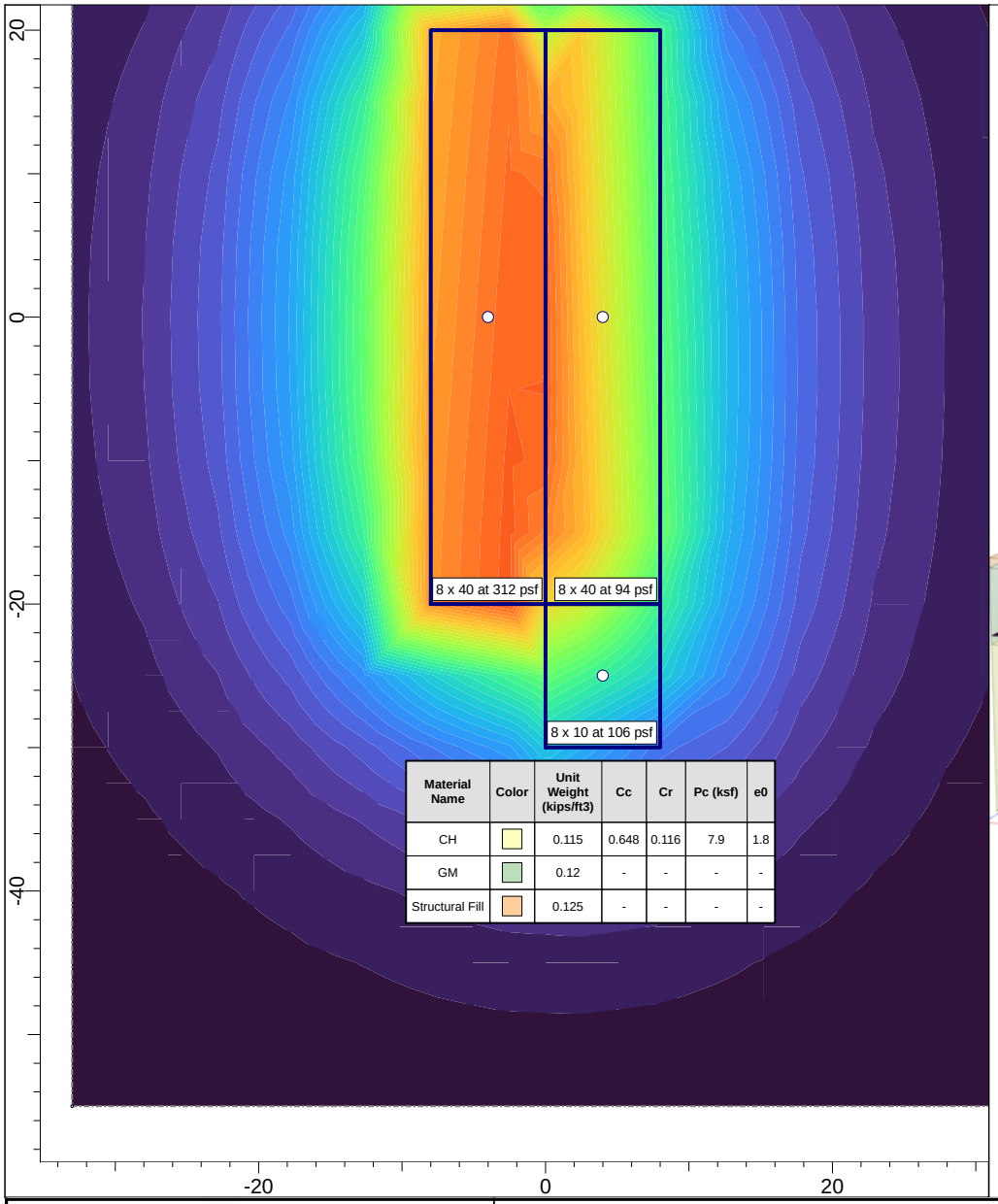
FLATHEAD BIO STATION
BOREHOLE LOCATIONS
PLAN VIEW

PIONEER
TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MT 59601
(406) 457-8252

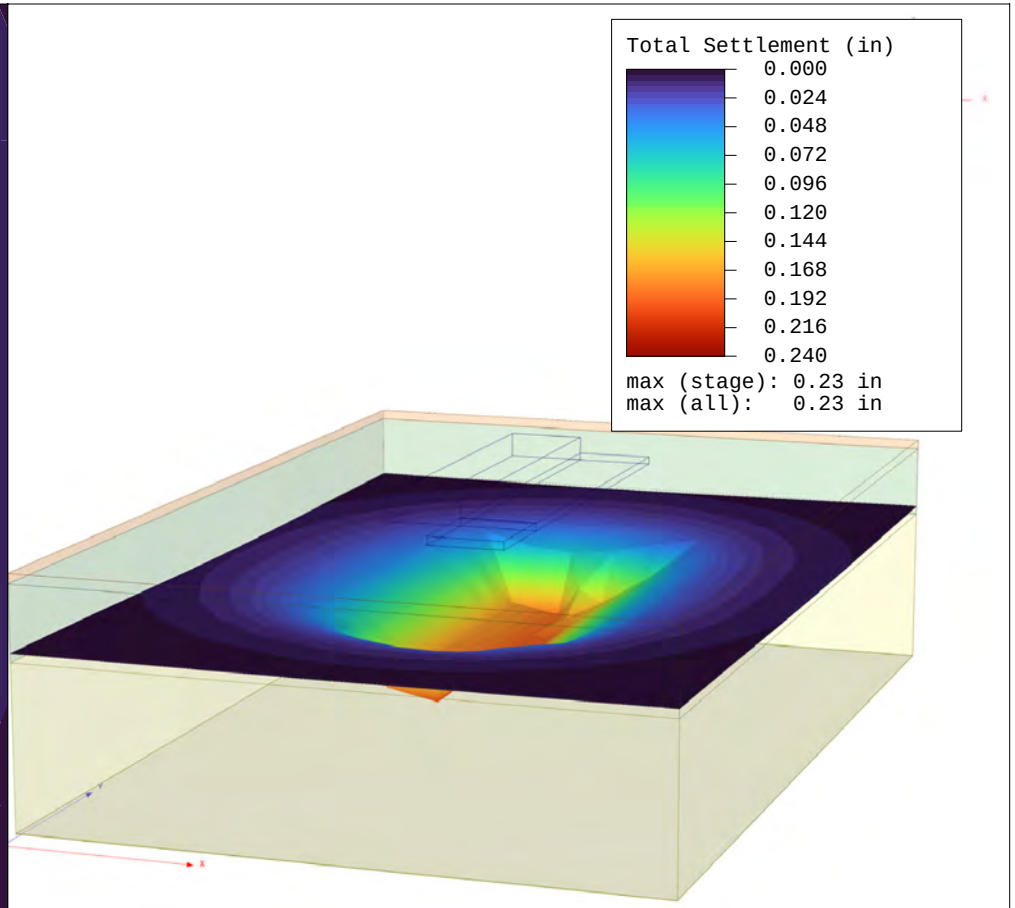
DATE: 8/24/2022

8/24/2022 11:40:07 AM Z:\SHARED\ACTIVE PROJECTS\GEOTECH\BH LOCATION FIGURES\FLATHEAD BIO STATION.DWG

Figure 2. Settlement Calculation of BH-02 Lithology

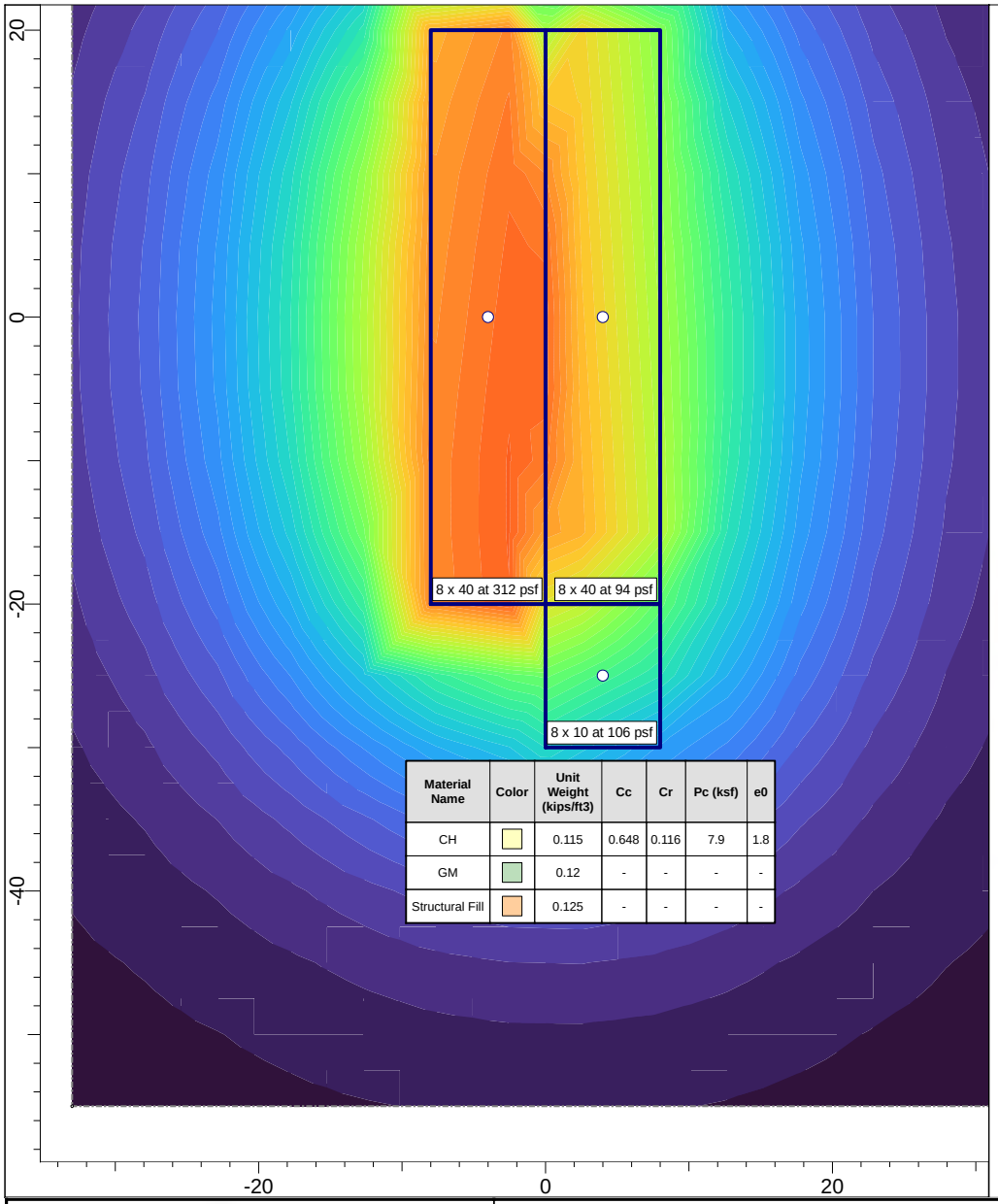


Material Name	Color	Unit Weight (kips/ft3)	Cc	Cr	Pc (ksf)	e0
CH		0.115	0.648	0.116	7.9	1.8
GM		0.12	-	-	-	-
Structural Fill		0.125	-	-	-	-

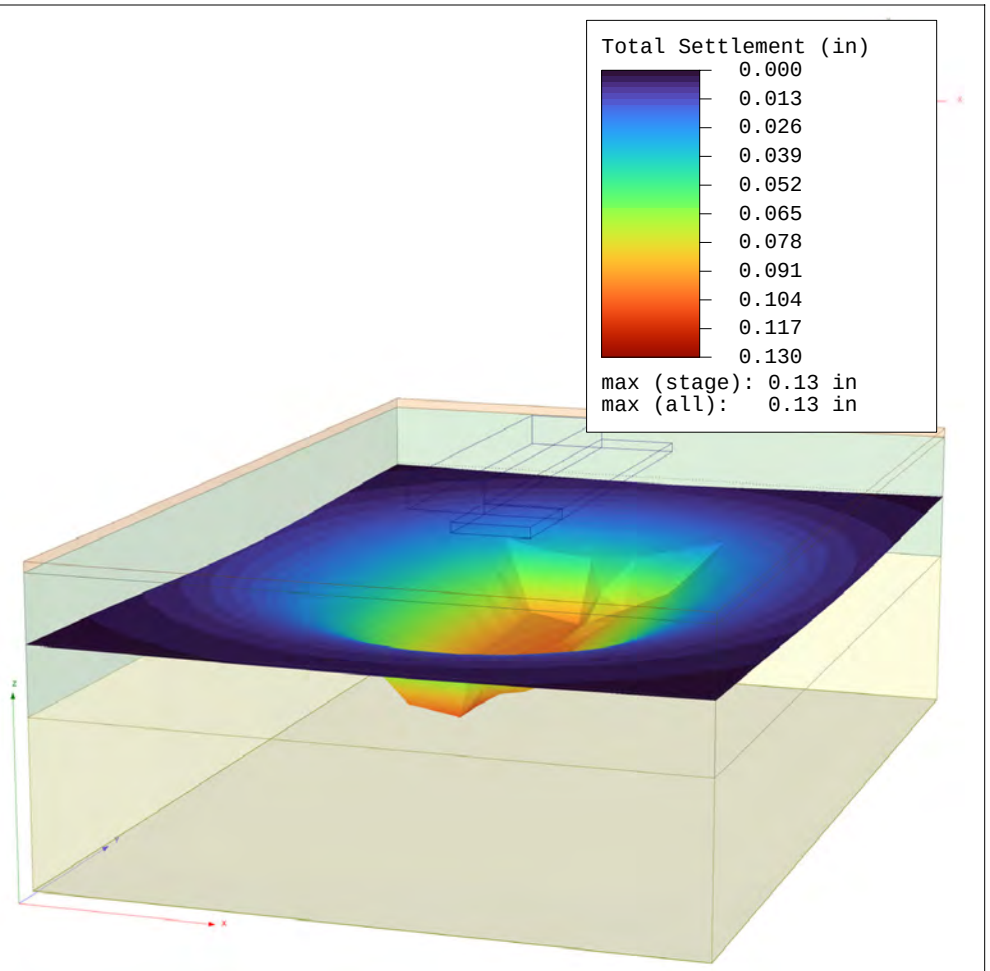


	Project	Flathead Bio Station	
	Analysis Description	1D Primary Settlement	
	Drawn By	SH/MB	*Company* Pioneer
SETTLE3 5.015	*Date*	December 2022	*File Name* FBS Water Treatment Plant Settle.s3z

Figure 3. Settlement Calculation of BH-03 Lithology



Material Name	Color	Unit Weight (kips/ft3)	Cc	Cr	Pc (ksf)	e0
CH		0.115	0.648	0.116	7.9	1.8
GM		0.12	-	-	-	-
Structural Fill		0.125	-	-	-	-



	Project	Flathead Bio Station	
	Analysis Description	1D Primary Settlement	
	Drawn By	SH/MB	*Company* Pioneer
	Date	December 2022	*File Name* FBS Water Treatment Plant Settle.s3z

SETTLE3 5.015

Appendix A
Borehole Logs

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	CA:	Casing Advancer
ST:	Thin-Walled Tube - 3" O.D., unless otherwise noted	DA:	Drill Auger
CB:	California Sampler - 2" I.D., 2.5" O.D., unless otherwise	HA:	Hand Auger
DB:	noted Diamond Bit Coring - 4", NX, unless otherwise noted	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	GS:	Grab Sample

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". The field blow counts are reported for each 6-inch interval, or portion thereof if greater than 50 blows are required to advance the full 6-inch interval. For over-sized split spoon samplers, non-standard hammers, or non-standard drop heights, the field penetration values are reported on the bore log. The values must be corrected to obtain the N-value.

WL:	Water Level	WS:	While Sampling	NE:	Not Encountered
WCl:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System, Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: gravel or sand. Cobbles and boulders are not part of the USCS system but are included, when present, as percentages. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; depending on their plasticity, they are described as clays or silts. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	< 2	Very Soft
500 - 1,000	2 - 4	Soft
1,001 - 2,000	5 - 8	Medium Stiff
2,001 - 4,000	9 - 15	Stiff
4,001 - 8,000	16 - 30	Very Stiff
8,000 +	30 +	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	California Barrel (CB) Blows/Ft.	Relative Density
0 - 4	0 - 6	Very Loose
5 - 10	7 - 18	Loose
11 - 30	19 - 58	Medium Dense
31 - 50	59 - 98	Dense
50 +	99 +	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

USCS* GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

*For AASHTO grain size the #4 sieve is replaced with the #10 sieve

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-Plastic	0
Slightly	1 - 5
Low	6 - 10
Medium	11 - 20
High	21 - 40
Very Highly	> 40

PIONEER TECHNICAL SERVICES, INC.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $1 \leq Cc \leq 3$		GW	Well-graded Gravel [F]
			Cu < and/or 1 > Cc > 3		GP	Poorly graded gravel [F]
		Gravels with Fines More than 12% fines	Fines classify as ML or MH		GM	Silty Gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey Gravel [F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1 \leq Cc \leq 3$		SW	Well-graded Sand [I]
			Cu < 6 and/or 1 > Cc > 3		SP	Poorly graded Sand [I]
		Sands with Fines More than 12% fines	Fines classify as ML or MH		SM	Silty Sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey Sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line		CL	Lean Clay [K,L,M]
			PI < 4 or plots below "A" line		ML	Silt [K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OL	Organic Clay [K,L,M,N]
			Liquid limit - not dried			Organic Silt [K,L,M,Q]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line		CH	Fat Clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OH	Organic Clay [K,L,M,P]
			Liquid limit - not dried			Organic Silt [K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt. GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60} / D_{10} \quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or " with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

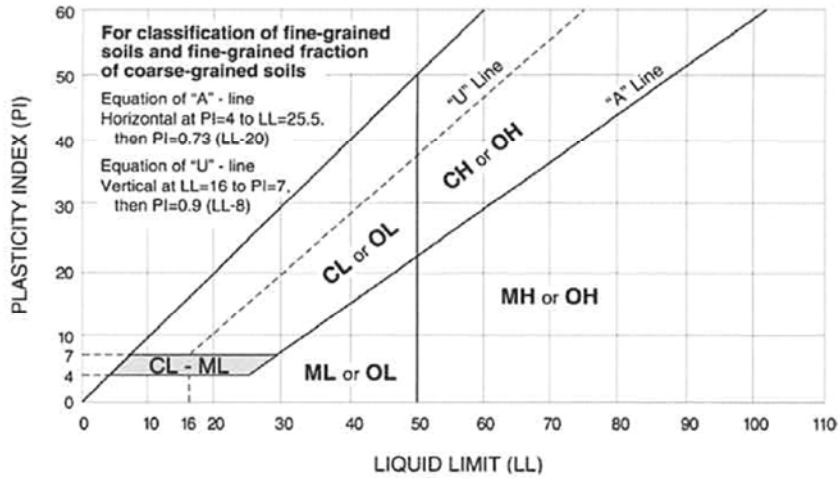
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



PIONEER TECHNICAL SERVICES, INC.

201 E Broadway Ste C
Helena, MT 59601
Phone: 406-457-8252
Fax: 442-1158

LOG OF BORING

Boring BH-01

PIONEER TECHNICAL SERVICES, INC.

Project: Flatehead Bio Station	**Rig:** Mobile B-59 **Hammer:** Auto	**Boring Location** N 1,354,323.6 ft **Coordinates:** E 857,352.2 ft	**Station:** **Offset:**
Project Number: / **UPN:**	**Boring Diameter:** 8"	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** ft
Date Started: 8/8/22 / **Date Finished:** 8/8/22	**Drilling Fluid:** None	**Location Source:** Handheld GPS, Uncorrected	**Elevation Source:**
Driller: C. Tigart **Logger:** S. Harris	**Abandonment Method:** Backfilled with Cuttings	**Township Range and Section:**	

Depth (ft) / Elev. (ft)	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
			83		7 - 9 - 9		Silty SAND with gravel (SM), medium dense, moist, brown, fine to coarse grained, rounded to subrounded.		7					Borehole located 3 yards west of existing pump house.
5			78		3 - 1 - 1		Lean CLAY (CL), very soft to soft, wet, gray. Low plasticity.	5.3						Driller notes very easy drilling from 5-10 feet.
10			100							29	18	86		
			100		2 - 2 - 4		▽		26					
15			72		5 - 2 - 6				23					
			100		6 - 8 - 13		Poorly-Graded SAND (SP), HEAVE, medium dense, wet, brown, fine to coarse grained.	16.5						
20								20.0	18					3 feet of heave into auger from 17-20 feet. Auger was at 20 feet but SPT began at 17 feet.

Boring Depth: 20.0 ft, *Elevation:*

Water Level Observations		Remarks:
▽ After Drilling:	▽ During Drilling: 13.0 ft	
	▼ After Drilling:	

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Fax: 442-1158

LOG OF BORING

Boring BH-02

PIONEER TECHNICAL SERVICES, INC.

Project: Flatehead Bio Station		**Rig:** Mobile B-59 **Hammer:** Auto	**Boring Location** N 1,354,318.9 ft **Coordinates:** E 857,433.0 ft	**Station:** **Offset:**
Project Number:	**UPN:**	**Boring Diameter:** 8"	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** ft
Date Started: 8/9/22	**Date Finished:** 8/9/22	**Drilling Fluid:** None	**Location Source:**	**Elevation Source:**
Driller: C. Tigart **Logger:** S. Harris		**Abandonment Method:** Backfilled with Cuttings	**Township Range and Section:**	

Depth (ft) / Elev. (ft)	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
			33		4 - 7 - 7		Silty GRAVEL with sand (GM), medium dense, dry, brown, rounded.		3					Borehole located 20 yards west of existing pump house.
5			44		7 - 8 - 10				9					
							Lean CLAY (CL), very soft to soft, wet, tan to gray. Low to medium plasticity.	7.5						
10			100		WH - WH - 5					41	22	88		
15			100		3 - 3 - 7				27					
							Silty Lean CLAY with sand (CL), medium stiff, wet, tan to gray. Low to medium plasticity.	16.0						
20			100		1 - 4 - 10		▽		20					2 feet of heave in auger from 18-20 feet.
							Clayey SAND (SC), medium dense, wet, tanish brown, fine grained.	24.0						
25			100		5 - 7 - 7				26					
							Poorly-Graded SAND with gravel (SP), medium dense, wet, brown, coarse grained, subrounded.	28.0						
30														

Water Level Observations		Remarks:
▽ During Drilling: 20.0 ft	▽ After Drilling:	
▼ After Drilling:		

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Fax: 442-1158

LOG OF BORING

Boring BH-02

PIONEER TECHNICAL SERVICES, INC.

Project: Flatehead Bio Station	**Rig:** Mobile B-59 **Hammer:** Auto	**Boring Location** N 1,354,318.9 ft **Coordinates:** E 857,433.0 ft	**Station:** **Offset:**
Project Number: / **UPN:**	**Boring Diameter:** 8"	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** ft
Date Started: 8/9/22 / **Date Finished:** 8/9/22	**Drilling Fluid:** None	**Location Source:**	**Elevation Source:**
Driller: C. Tigart **Logger:** S. Harris	**Abandonment Method:** Backfilled with Cuttings	**Township Range and Section:**	

Depth (ft) / Elev. (ft)	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
			100		7 - 7 - 20		Poorly-Graded SAND with gravel (SP), Cobbles.		13					
35			100		3 - 13 - 21									1.5 feeet of heave in auger from 33.5 to 35 feet. Driller notes cobbly from 30-40 feet.
40			83		4 - 14 - 16									2 feet of heave in auger from 38 to 40 feet.
45			0		50/0.0ft									
			10		52/6.0ft		SHALE, black.	46.5						Auger refusal at 47 feet.
								47.5						

Boring Depth: 47.5 ft, *Elevation:*

Water Level Observations		Remarks:
After Drilling:	During Drilling: **20.0 ft**	
	After Drilling:	

201 E Broadway Ste C
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Fax: 442-1158

LOG OF BORING

Boring BH-03

PIONEER TECHNICAL SERVICES, INC.

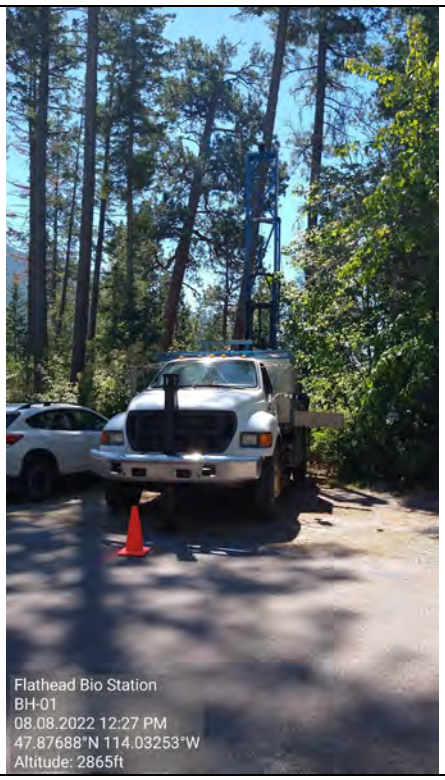
Project: Flatehead Bio Station	**Rig:** Mobile B-59 **Hammer:** Auto	**Boring Location** N 1,354,301.6 ft **Coordinates:** E 857,478.7 ft	**Station:** **Offset:**
Project Number: / **UPN:**	**Boring Diameter:** 8"	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** ft
Date Started: 8/8/22 / **Date Finished:** 8/8/22	**Drilling Fluid:** None	**Location Source:**	**Elevation Source:**
Driller: C. Tigart **Logger:** S. Harris	**Abandonment Method:** Backfilled with Cuttings	**Township Range and Section:**	

Depth (ft) / Elev. (ft)	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
5			50		3 - 4 - 4		Silty GRAVEL with sand (GM), loose to medium dense, dry to wet, brown, fine to coarse grained, rounded. Few organics.							BH located 60 yards east of existing pump house.
			28		3 - 2 - 4									
			22		3 - 5 - 6				10					
			28		10 - 9 - 12									
10			6		WH - WH - WH		Poorly-Graded SAND (SP), very loose, wet, fine grained.	9.5	25					
							Fat CLAY (CH), very soft, wet, brown to tan. High plasticity.	13.0						
15			100							55	22	100		
			100		WH - WH - WH									
20			100		WH - WH - WH									
			100		2 - 7 - 7			23.5						

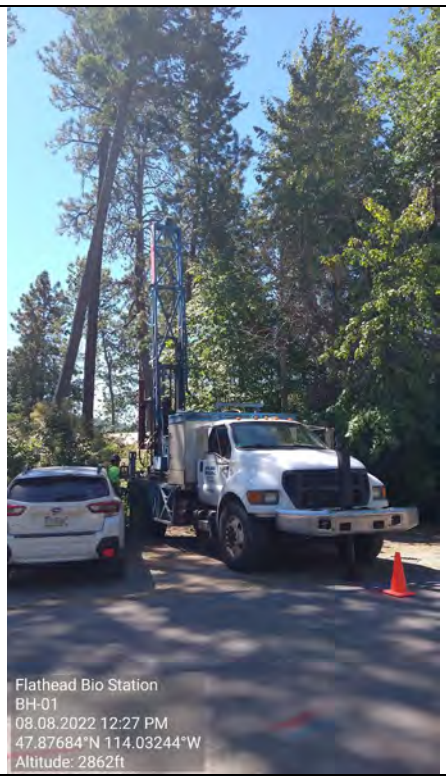
Boring Depth: 23.5 ft, *Elevation:*

Water Level Observations		Remarks:
▽ During Drilling: **Not Encountered**	▽ During Drilling:	
▼ After Drilling:	▼ After Drilling:	

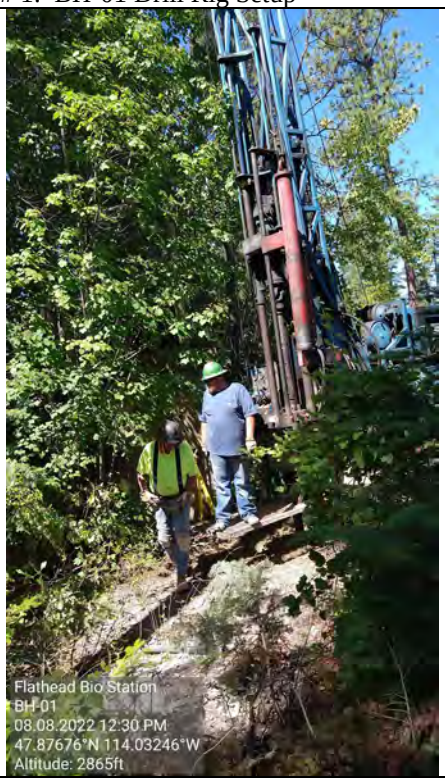
Appendix B
Photograph Log



Picture # 1: BH-01 Drill Rig Setup



Picture # 2: BH-01 Drill Rig Setup



Picture # 3: BH-01 Drill Rig Setup

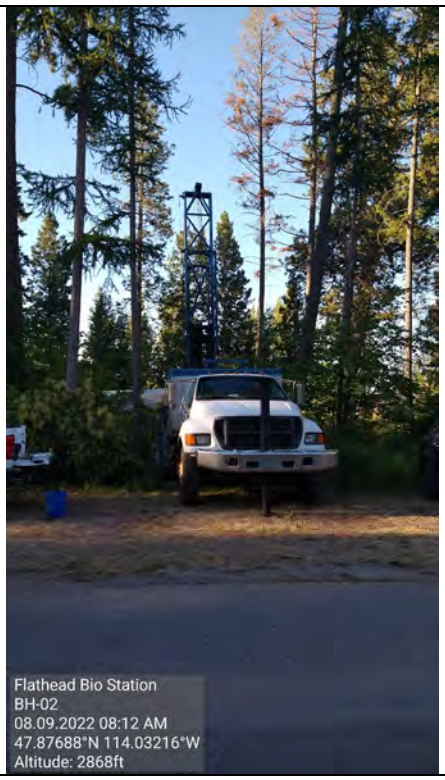
Picture # 4: BH-01 SPT from 0-1.5 feet

Picture # 5: BH-01 SPT from 5-6.5 feet

Picture # 6: BH-01 SPT from 12-13.5 feet

Picture # 7: BH-01 SPT from 15-16.5 feet

Picture # 8: BH-01 SPT from 17-18.5 feet



Picture # 9: BH-02 Drill Rig setup

Picture # 10: BH-02 Drill Rig Setup

Picture # 11: BH-02 SPT form 0-1.5 feet

Picture # 12: BH-02 from 5-6.5 feet.

Picture # 13: BH-02 SPT from 10-11.5 feet

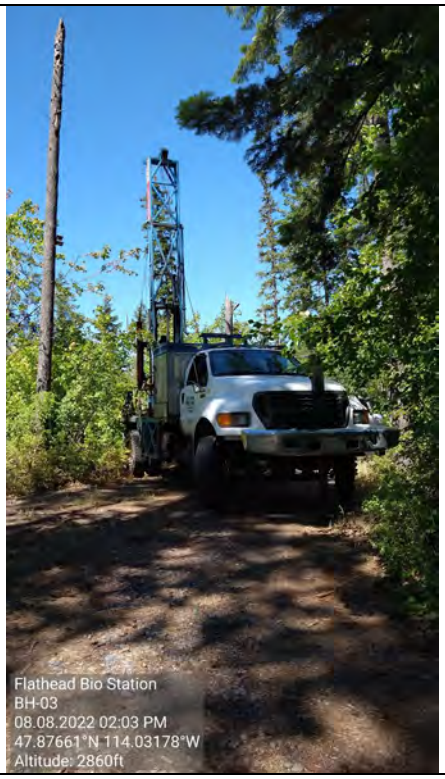
Picture # 14: BH-02 SPT from 10-11.5 feet

Picture # 15: BH-02 SPT from 15-16.5 feet

Picture # 16: BH-02 SPT from 18-19.5 feet

Picture # 17: BH-02 SPT from 25-26.5 feet

Picture # 18: BH-02 SPT from 30-31.5 feet.



Picture # 19: BH-03 Drill Rig Setup

Picture # 20: BH-03 Drill Rig Setup

Picture # 21: BH-03 SPT from 0-1.5 feet

Picture # 22: BH-03 SPT from 2.5-4 feet

Picture # 23: BH-03 SPT from 5-6.5 feet

Picture # 24: BH-03 SPT from 7.5-9 feet

	
Picture # 25: BH-03 SPT from 10-11.5 feet	Picture # 26: BH-03 SPT from 17-18.5 feet
	Intentionally Left Blank
Picture # 27: BH-03 SPT from 20-21.5 feet	Picture # 28:

Appendix C
Laboratory Data

PIONEER TECHNICAL SERVICES, INC.
201 East Broadway, Suite C
Helena, Montana 59601
Phone (406)457-8252 Fax (406)442-1158
www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

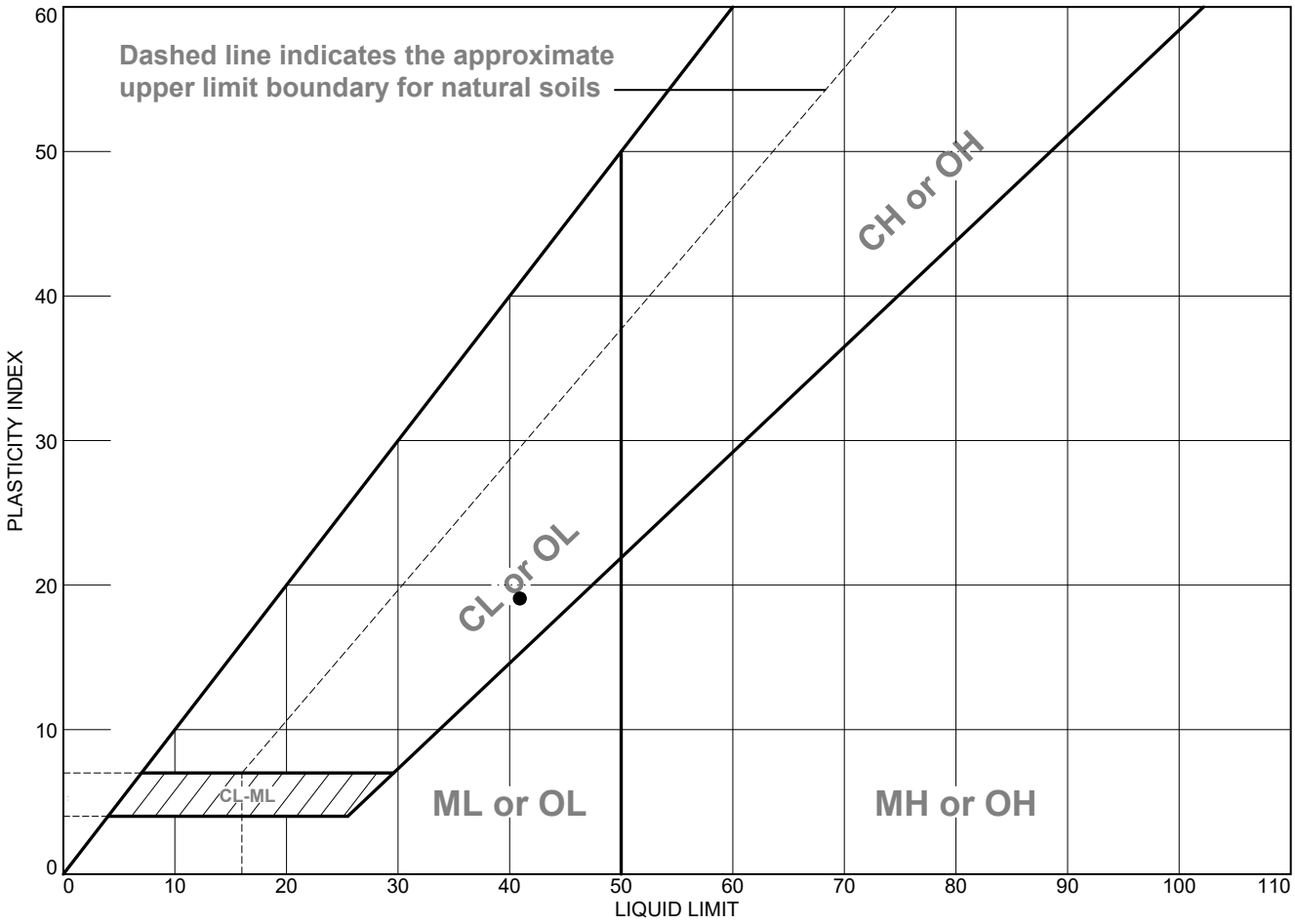
Project Name: Flathead Lake Bio Station **Project Number:**

Lab No:	2683	26839	26840	26841	26842	26843	26845	26846	26847	26848
BH or Loc:	BH-01	BH-01	BH-01	BH-01	BH-02	BH-02	BH-02	BH-02	BH-02	BH-02
Depth:	0-1.5	12-13.5	15-16.5	20-21.5	0-1.5	5-6.5	15-16.5	18-19.5	25-26.5	30-31.5
Date Tested:	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022	8/10/2022
Pan No:	86	116	144	109	91	146	13	28	68	83
Wet Wt, & Pan (g):	386.9	418.4	388.1	524	439.7	488.5	539.4	429.3	582.2	553.3
Dry Wt, & Pan (g):	368.3	348.9	330.4	457.3	430.1	456.8	442.9	371.1	478.3	500.1
Loss of Moisture	18.6	69.5	57.7	66.7	9.6	31.7	96.5	58.2	103.9	53.2
Wt. of Pan (g):	83.3	85.1	83.5	81.7	81.4	81.7	83.5	84.4	81.8	81.5
Wt. of Dry Soil (g):	285	263.8	246.9	375.6	348.7	375.1	359.4	286.7	396.5	418.6
M. Content (%):	**6.5**	**26.3**	**23.4**	**17.8**	**2.8**	**8.5**	**26.9**	**20.3**	**26.2**	**12.7**

Lab No:	26856	26857								
BH or Loc:	BH-03	BH-03								
Depth:	7.5-9	10-11.5								
Date Tested:	8/10/2022	8/10/2022								
Pan No:	29	15								
Wet Wt, & Pan (g):	466.6	148.7								
Dry Wt, & Pan (g):	433	135.4								
Loss of Moisture	33.6	13.3								
Wt. of Pan (g):	82.2	81.3								
Wt. of Dry Soil (g):	350.8	54.1								
M. Content (%):	**9.6**	**24.6**								

Revised 10-16-15

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	lean clay	41	22	19	90	88	CL

Project No. 2201061 **Client:** Anderson-Montggomery Consulting Engineers

Project: Flathead Bio Station

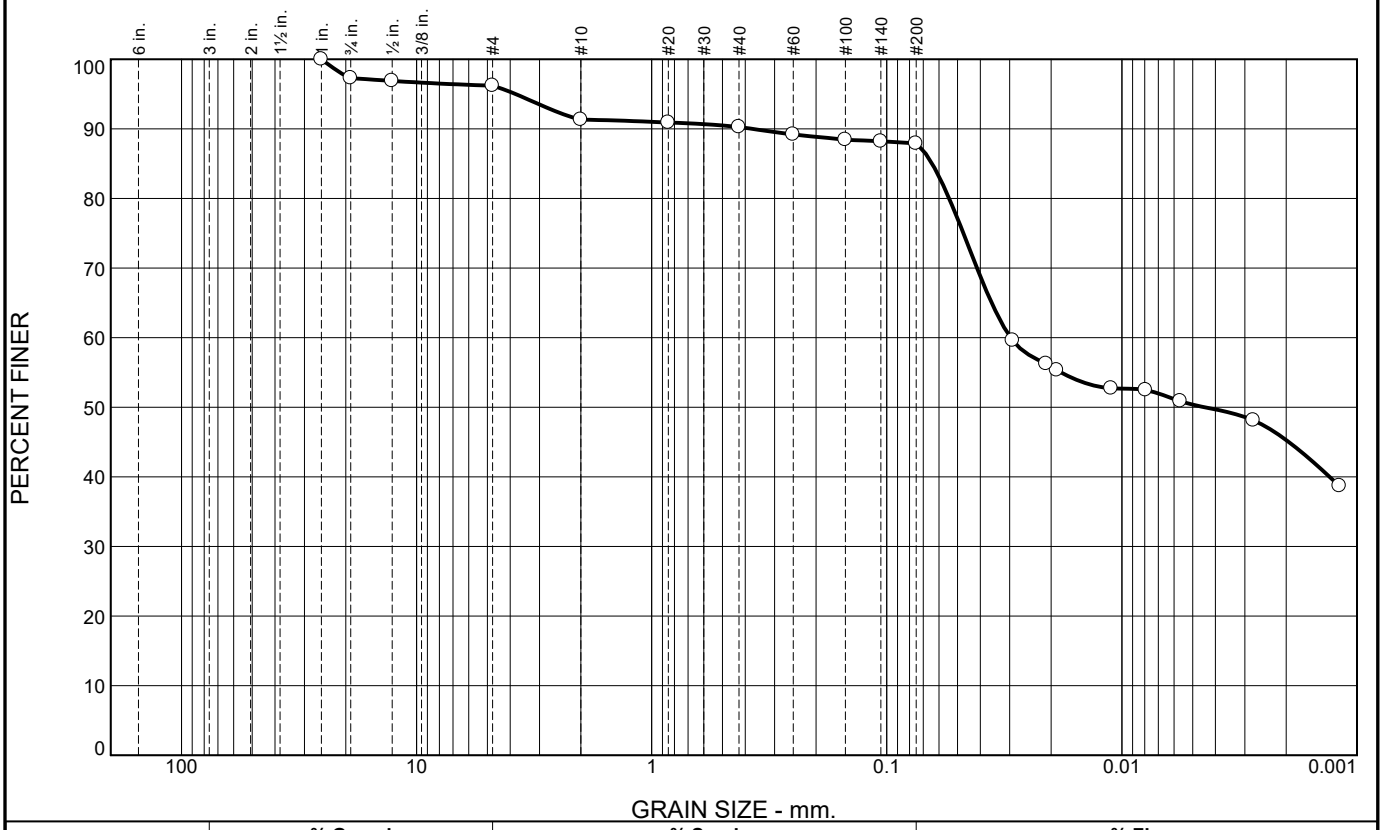
●**Location:** BH-02 **Depth:** 10-11.5' **Sample Number:** 26844H

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	1	5	1	2	38	50

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4"	97		
1/2"	97		
#4	96		
#10	91		
#20	91		
#40	90		
#60	89		
#100	88		
#140	88		
#200	88		
0.0291 mm.	60		
0.0210 mm.	56		
0.0189 mm.	55		
0.0111 mm.	53		
0.0079 mm.	52		
0.0056 mm.	51		
0.0028 mm.	48		
0.0012 mm.	39		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 22 LL= 41 PI= 19

Coefficients

D_{90}= 0.3737 D_{85}= 0.0641 D_{60}= 0.0297
D_{50}= 0.0044 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(17)

Remarks

F.M.=0.58

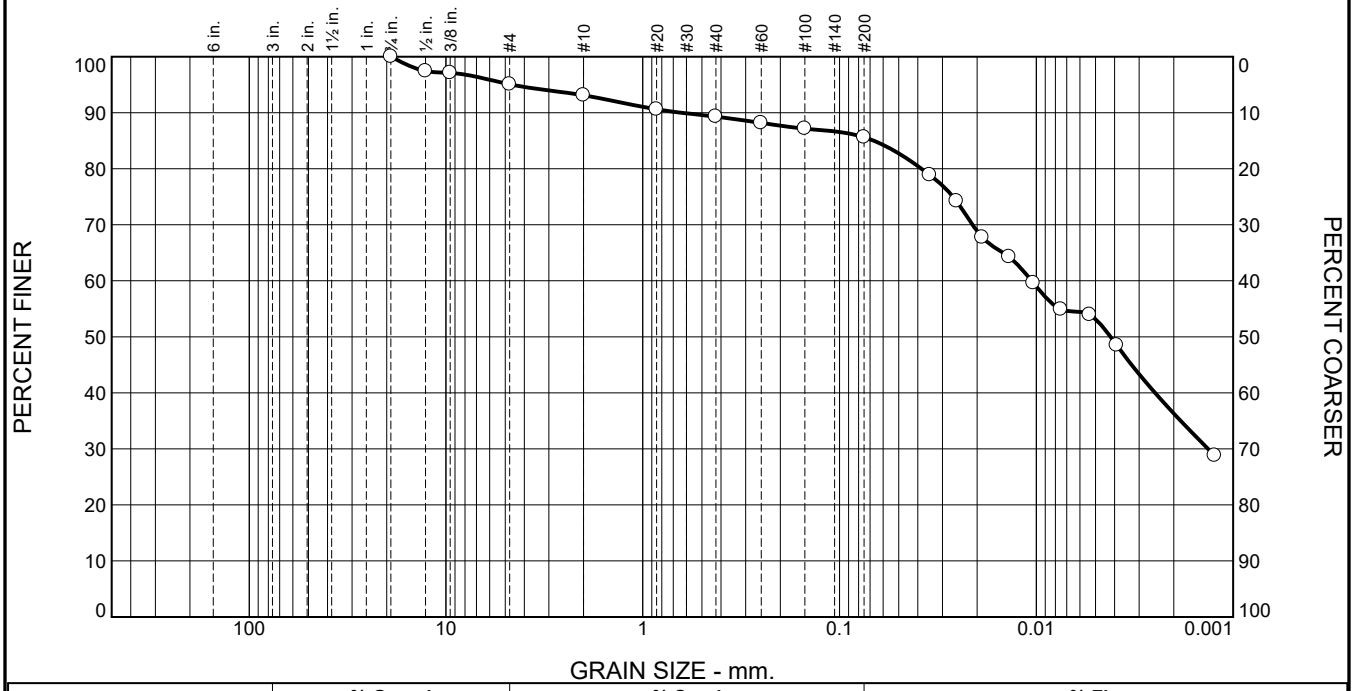
Location: BH-02
Sample Number: 26844H **Depth:** 10-11.5' **Date:** 08/26/22

PIONEER TECHNICAL SERVICES, INC.

Client: Anderson-Montggomery Consulting Engineers
Project: Flathead Bio Station

Project No: 2201061 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.9	2.0	3.8	3.7	32.4	53.2

Test Results (ASTM D7928 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	97.4		
3/8"	97.1		
#4	95.1		
#10	93.1		
#20	90.6		
#40	89.3		
#60	88.2		
#100	87.1		
#200	85.6		
0.0348 mm.	78.9		
0.0254 mm.	74.2		
0.0189 mm.	67.8		
0.0138 mm.	64.3		
0.0103 mm.	59.6		
0.0075 mm.	54.9		
0.0054 mm.	54.0		
0.0039 mm.	48.5		
0.0012 mm.	28.8		

* (no specification provided)

Material Description

lean clay

Atterberg Limits (ASTM D 4318)

PL= 18 **LL=** 29 **PI=** 11

Classification

USCS (D 2487)= CL **AASHTO (M 145)=** A-6(8)

Coefficients

D_{90}= 0.6374 D_{85}= 0.0670 D_{60}= 0.0106
D_{50}= 0.0042 D_{30}= 0.0013 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8/10/2022 **Date Tested:** 8-22-2022

Tested By: SP

Checked By: NG

Title: Laboratory Manager

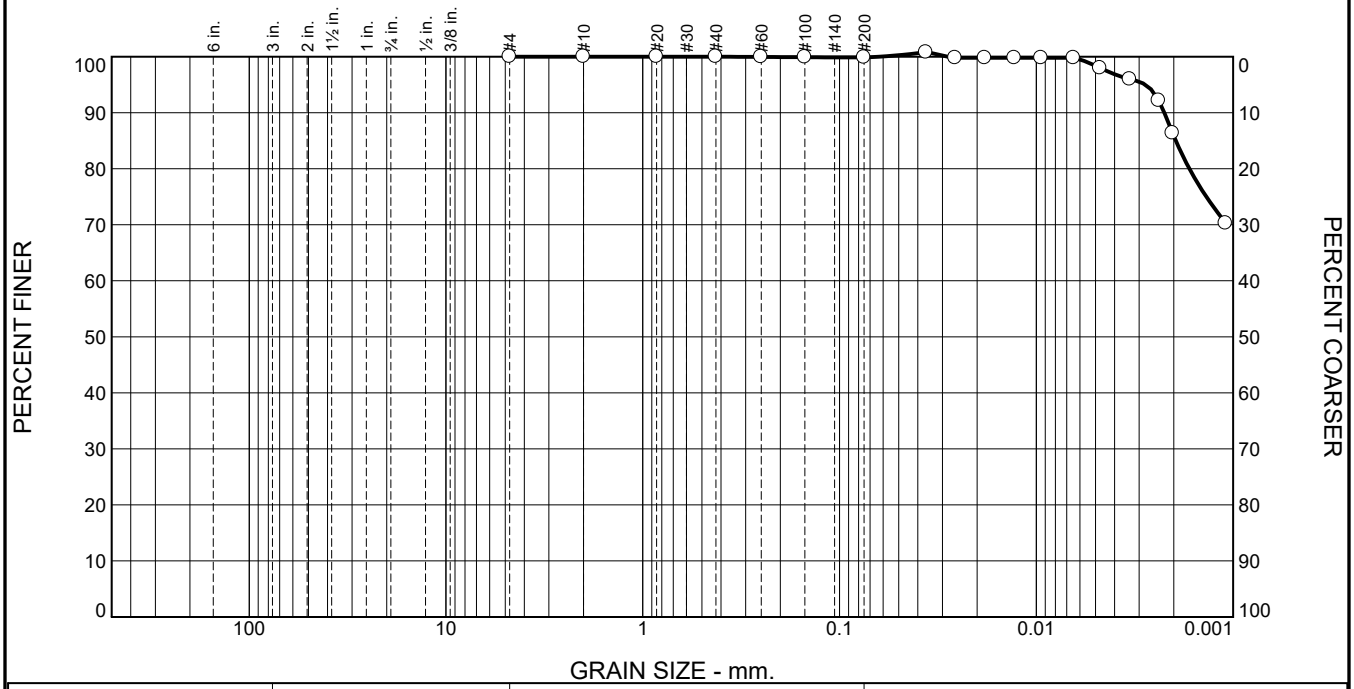
Source of Sample: BH-01 **Depth:** 10-12'
Sample Number: G22267 **Date Sampled:**

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Client: Anderson-Montgomery Consulting
Project: Flathead Lake Bio Station

Project No: **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			0.0	0.0	0.1	1.5	98.4

Test Results (ASTM D7928 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	100.0		
#40	100.0		
#60	100.0		
#100	99.9		
#200	99.9		
0.0363 mm.	100.8		
0.0258 mm.	99.8		
0.0183 mm.	99.8		
0.0129 mm.	99.8		
0.0094 mm.	99.8		
0.0065 mm.	99.8		
0.0047 mm.	98.0		
0.0033 mm.	96.0		
0.0024 mm.	92.2		
0.0020 mm.	86.3		
0.0011 mm.	70.3		

* (no specification provided)

Material Description

fat clay

Atterberg Limits (ASTM D 4318)

PL= 22 **LL=** 55 **PI=** 33

Classification

USCS (D 2487)= CH **AASHTO (M 145)=** A-7-6(37)

Coefficients

D_{90}= 0.0022 D_{85}= 0.0020 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8-10-2022 **Date Tested:** 8-22-2022

Tested By: TS/BB

Checked By: NG

Title: Laboratory Manager

Source of Sample: BH-03 **Depth:** 15-17' **Date Sampled:**
Sample Number: G22268

Pioneer Technical Services, Inc.

106 Pronghorn Trail, Suite A - Bozeman, MT 59718

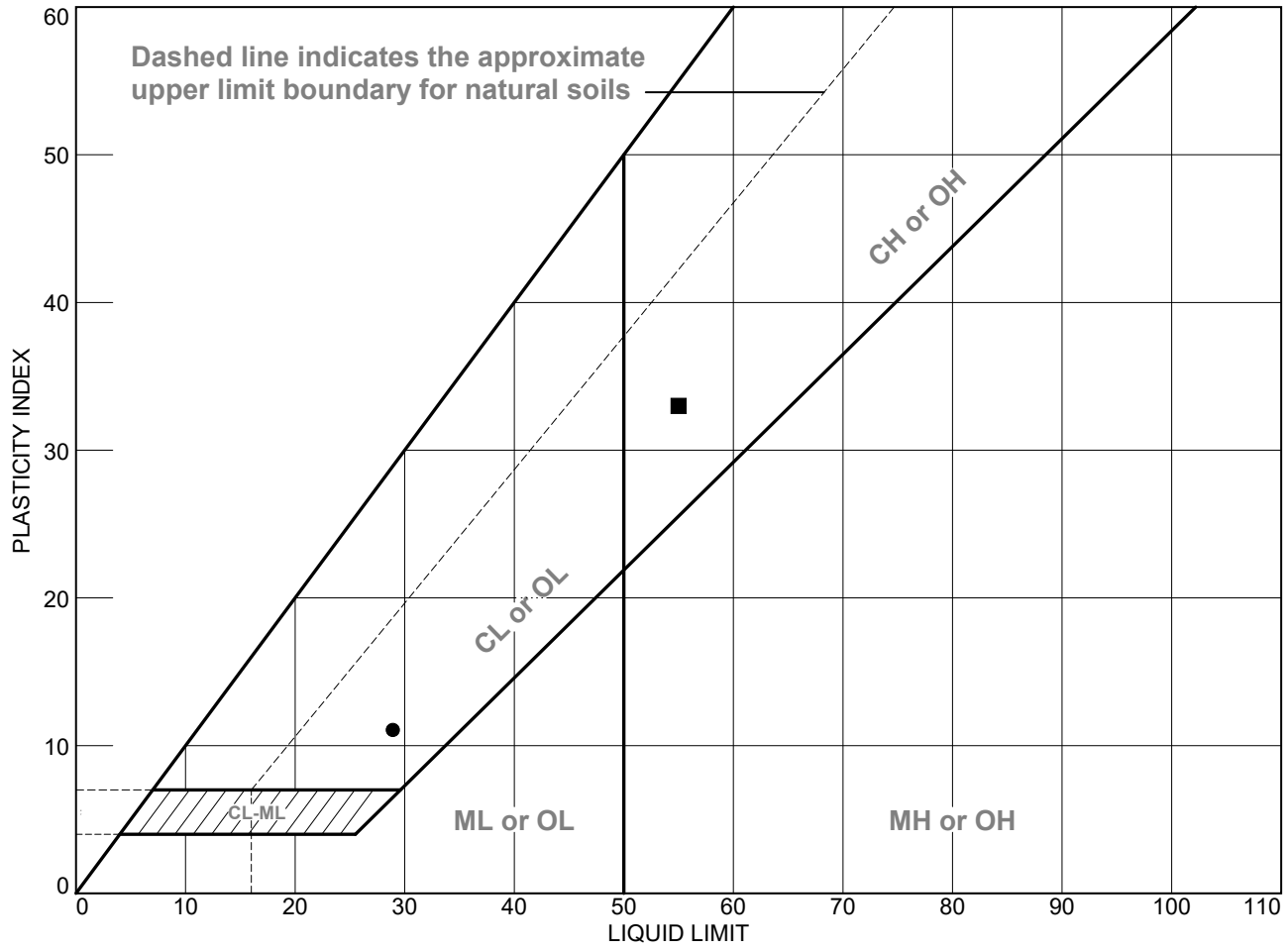
Ph. 406-388-8578 - Fax 406-388-8579

Client: Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Project No: **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

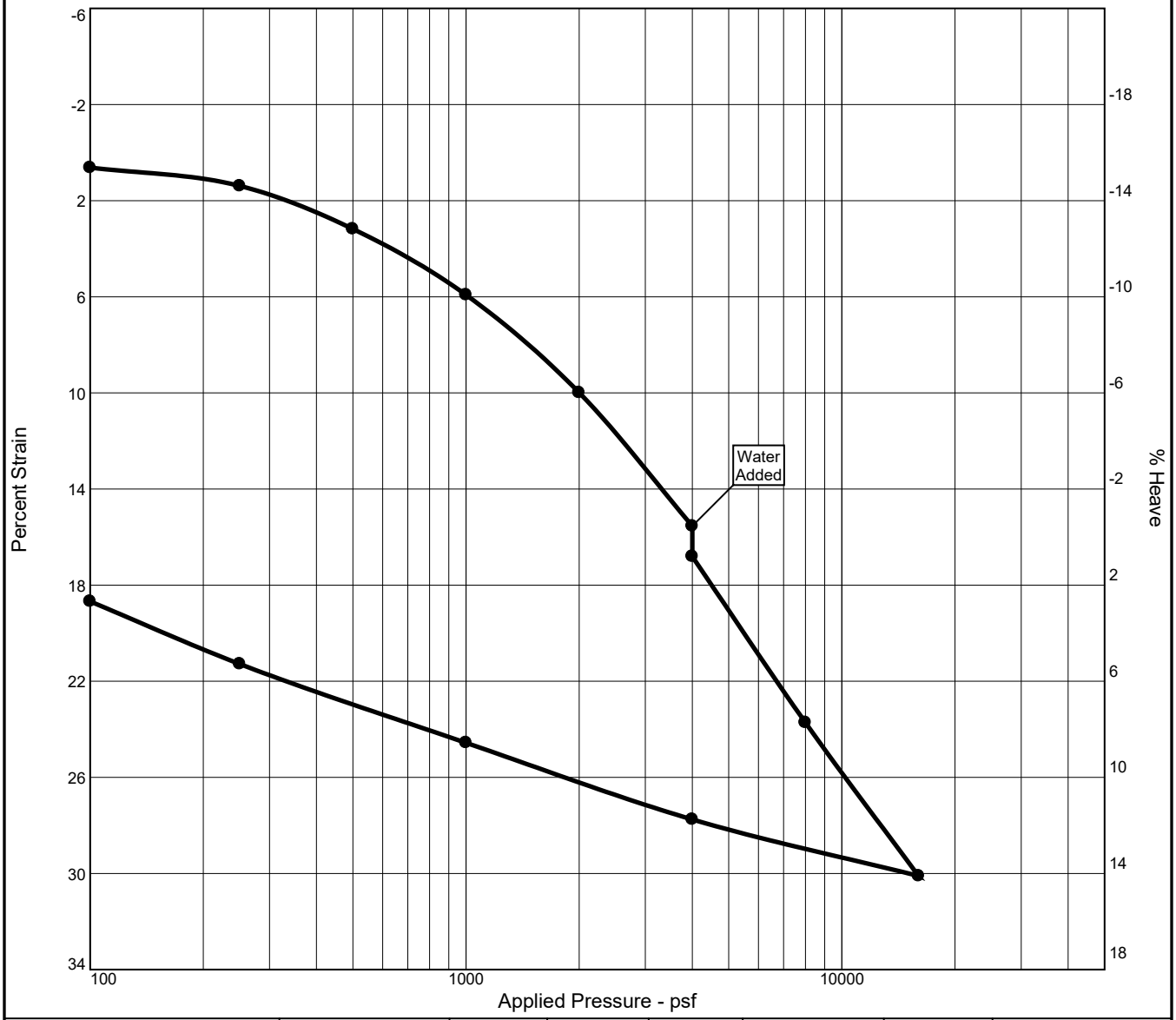
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	BH-01	G22267	10-12'		18	29	11	CL
■	BH-03	G22268	15-17'		22	55	33	CH

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Client: Anderson-Montgomery Consulting
Project: Flathead Lake Bio Station
Project No.: **Figure**

Tested By: SP/TS **Checked By:** NG

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
90.9 %	62.1 %	62.1	55	33	2.7	7920	0.60	1.844

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(37)

Project No. **Client:** Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Source of Sample: BH-03 **Depth:** 15-17' **Sample Number:** G22268

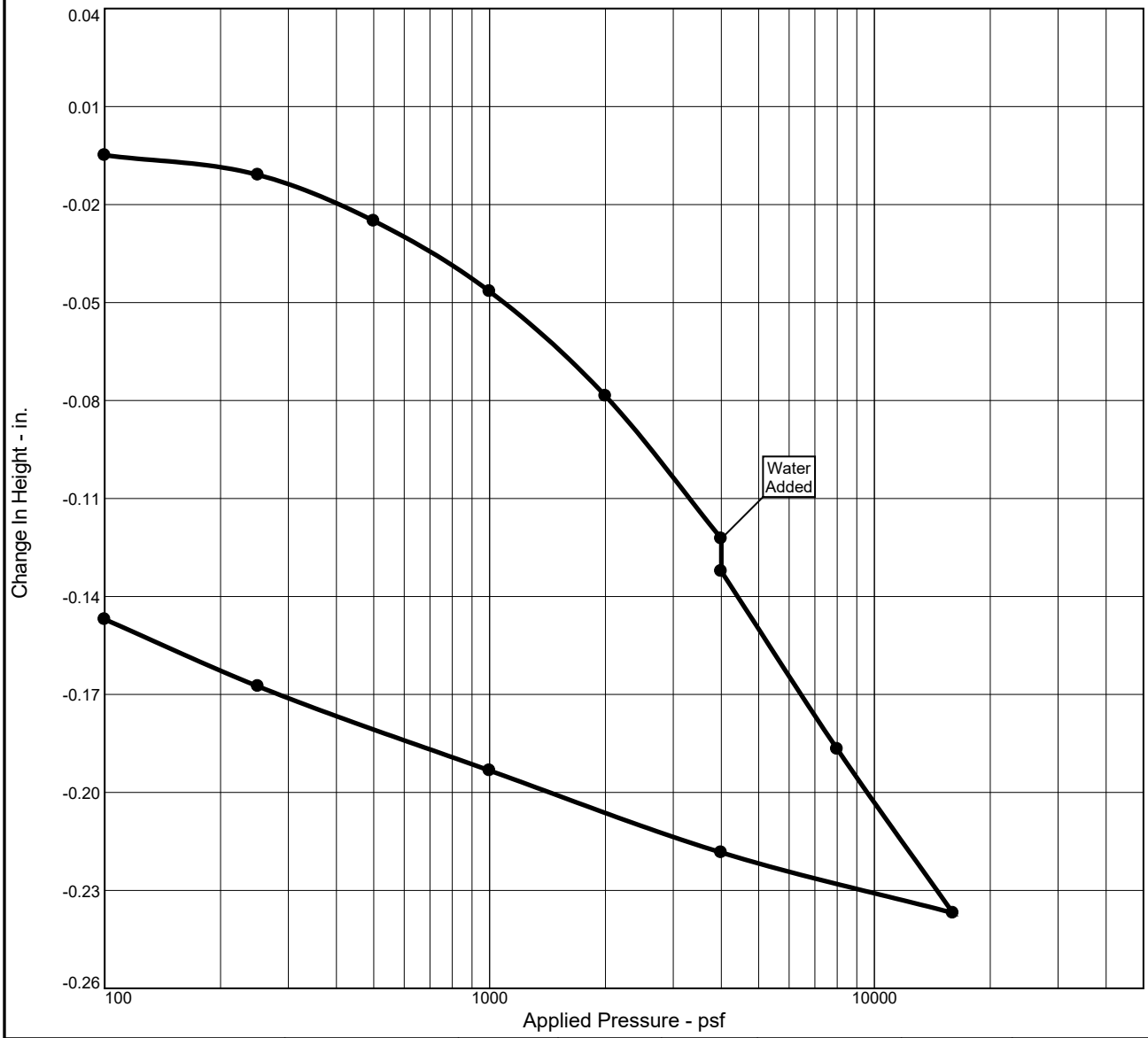
Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Remarks:
Specific Gravity assumed at 2.70

Figure

Tested By: TS **Checked By:** NG

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
90.9 %	62.1 %	62.1	55	33	2.7	7920	0.60	1.844

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Specific Gravity assumed at 2.70

Pioneer Technical Services, Inc.
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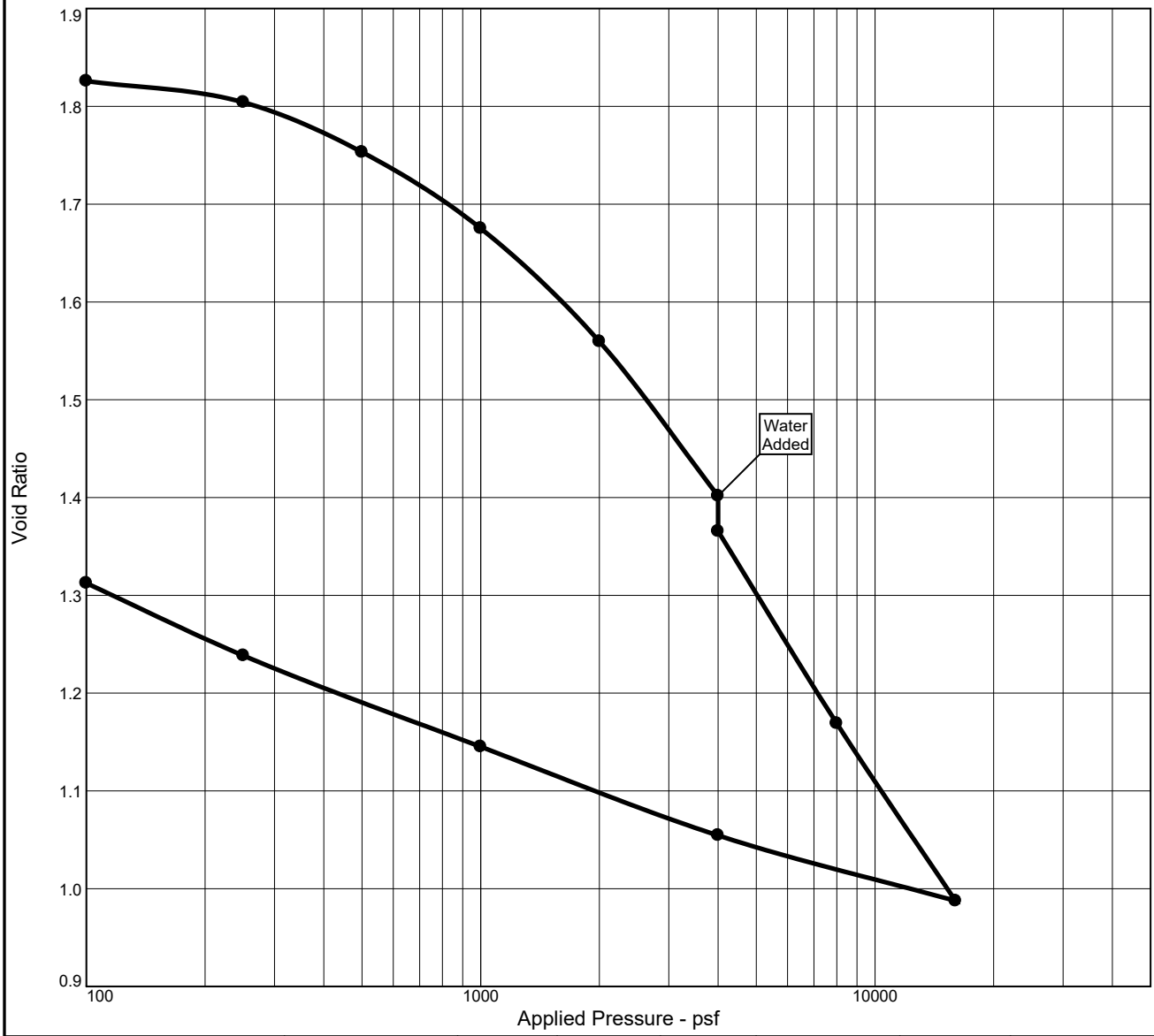
Figure

Tested By: TS **Checked By:** NG

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
90.9 %	62.1 %	62.1	55	33	2.7	7920	0.60	1.844

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Project No. **Client:** Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Source of Sample: BH-03 **Depth:** 15-17' **Sample Number:** G22268

Remarks:
Specific Gravity assumed at 2.70

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Figure

Tested By: TS **Checked By:** NG

CONSOLIDATION TEST REPORT

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
87.4 %	32.8 %	87.2	29	11	2.7	5789	0.27	1.012

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(8)

Project No. **Client:** Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Source of Sample: BH-01 **Depth:** 10-12' **Sample Number:** G22267

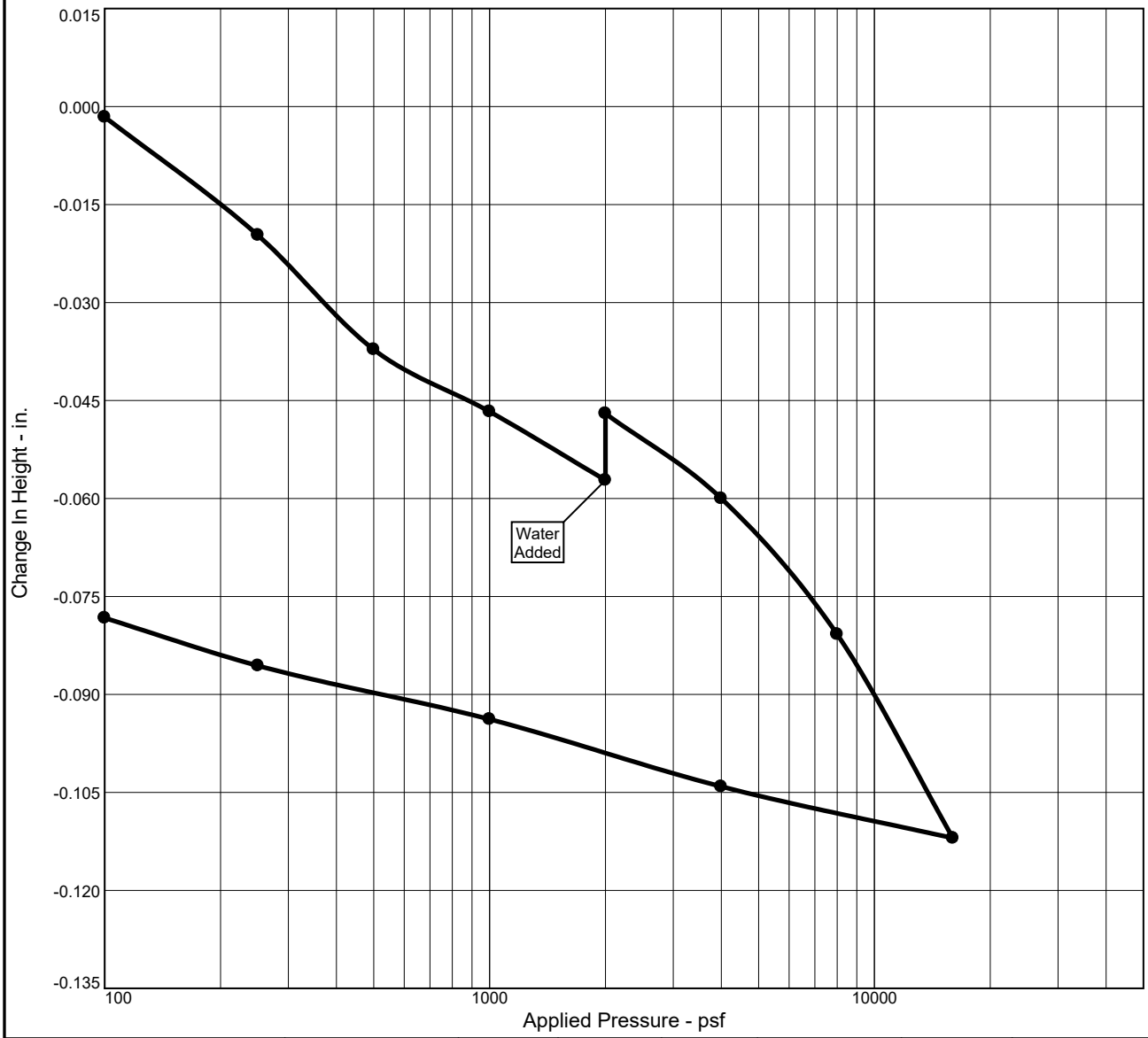
Remarks:
Specific Gravity assumed at 2.7

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Figure

Tested By: TS **Checked By:** NG

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
87.4 %	32.8 %	87.2	29	11	2.7	5789	0.27	1.012

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(8)

Project No. **Client:** Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Source of Sample: BH-01 **Depth:** 10-12' **Sample Number:** G22267

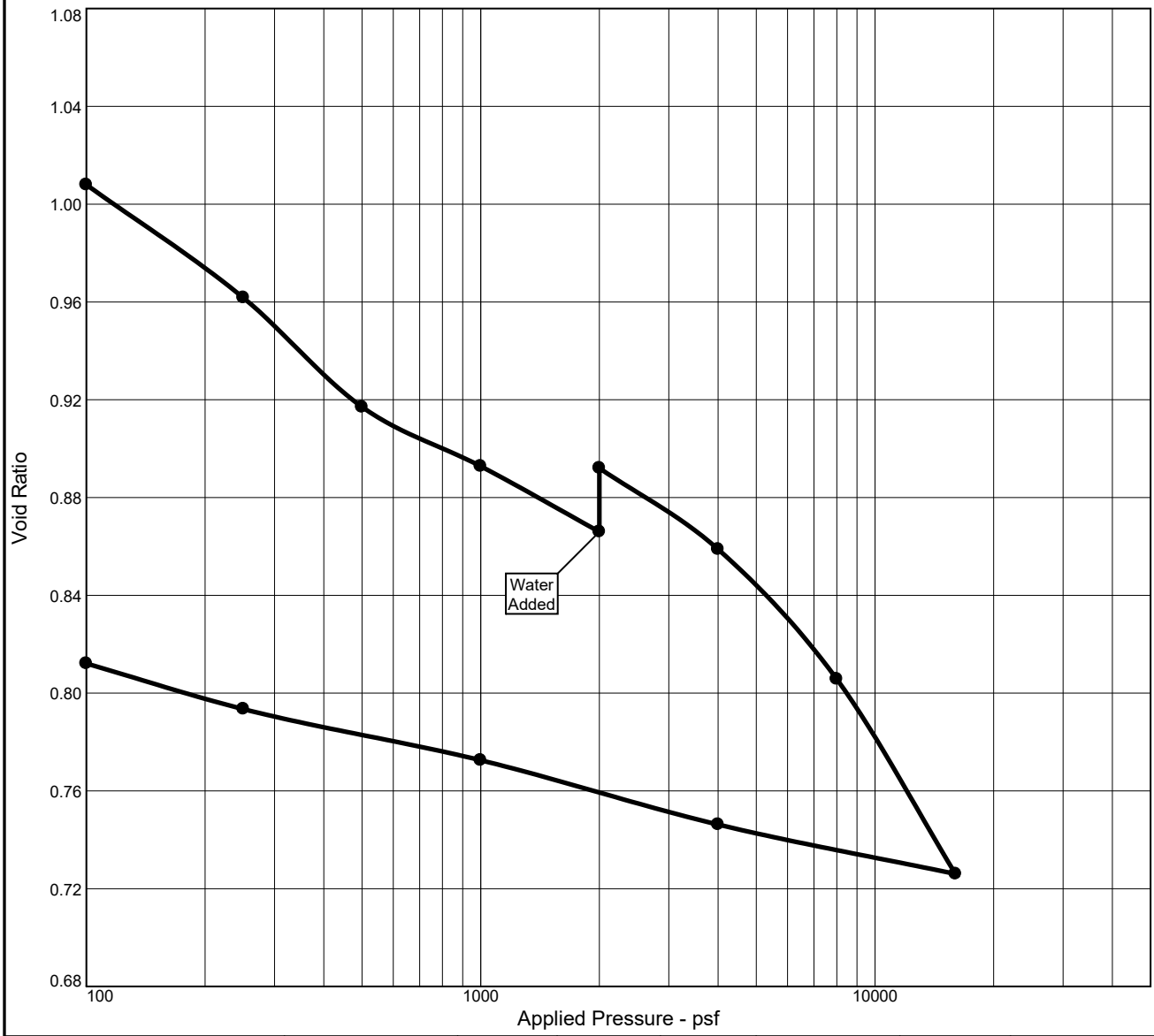
Remarks:
Specific Gravity assumed at 2.7

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Figure

Tested By: TS **Checked By:** NG

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture							
87.4 %	32.8 %	87.2	29	11	2.7	5789	0.27	1.012

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(8)

Project No. **Client:** Anderson-Montgomery Consulting

Project: Flathead Lake Bio Station

Source of Sample: BH-01 **Depth:** 10-12' **Sample Number:** G22267

Remarks:
Specific Gravity assumed at 2.7

Pioneer Technical Services, Inc.
106 Pronghorn Trail, Suite A - Bozeman, MT 59718
Ph. 406-388-8578 - Fax 406-388-8579

Figure

Tested By: TS **Checked By:** NG

Alpine Analytical Laboratory

1315 Cherry, Helena, MT 59601
(406)449-6282

Client: **Pioneer Technical Services**

Date Reported: 31-Aug-22

Sample ID: BH-02
Project ID: Flathead Bio Station (FBS)

Chain of Custody #: 4238

Laboratory ID: 04J398
Sample Matrix: Soil

Date / Time Sampled: None Given
Date / Time Received: 25-Aug-22 @ 15:40

Parameter	Result	PQL	Analyzed Date/Time	By	Method Reference
Soluble Sulfate, %	0.0034	0.00005	30-Aug-22 @ 14:17	CE	EPA 300.0
pH, s.u.	7.66	0.01	29-Aug-22 @ 15:10	CE	MT 232-04

Comments:

PQL - Practical Quantitation Limit

References:

Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020
Method of Sampling and Testing MT232-04*, Soil Corrosion Test* (Montana Method).

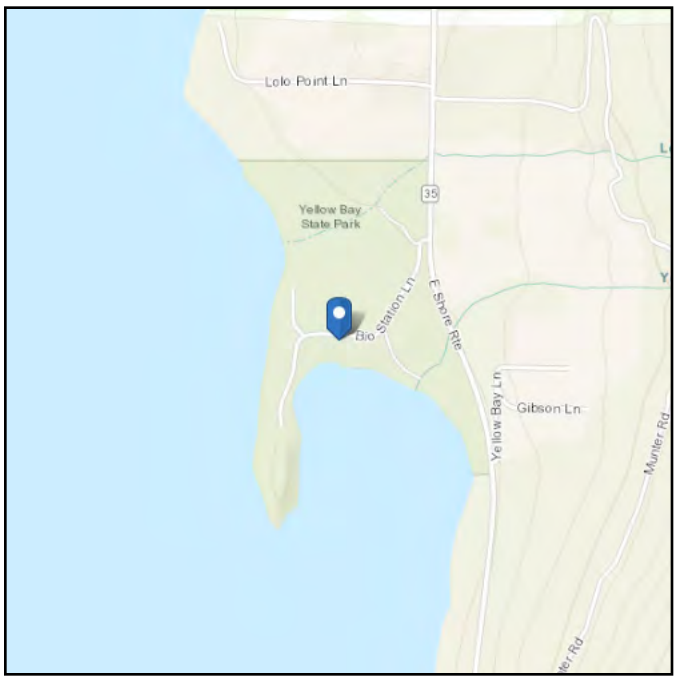
Reviewed by: CE

Appendix D
Seismic Data

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	47.876782
Risk Category:	II	**Longitude:**	-114.032396
Soil Class:	D - Stiff Soil	**Elevation:**	2904.98 ft (NAVD 88)



Seismic

D - Stiff Soil

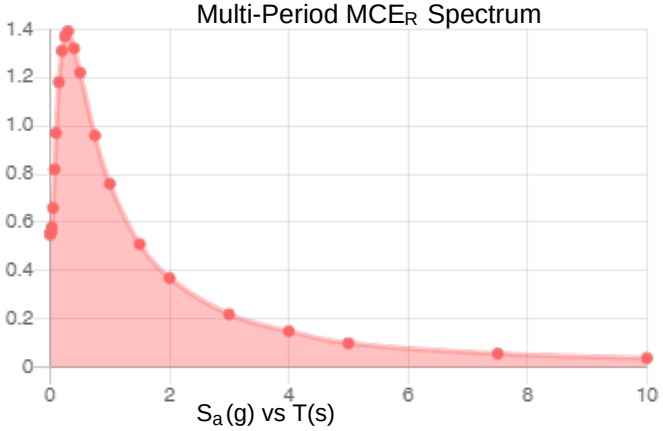
Site Soil Class:

Results:

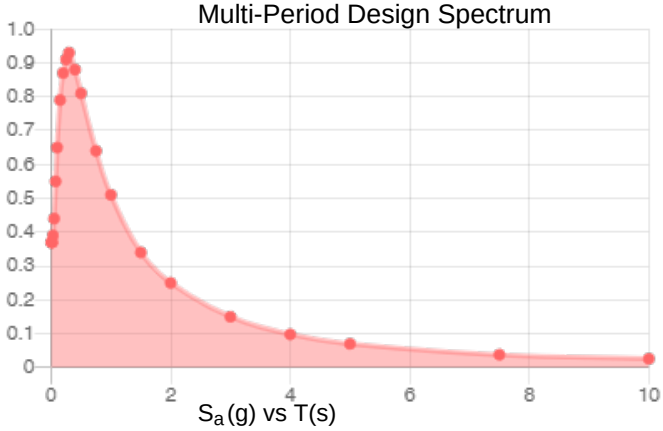
PGA_M :	0.51	T_L :	6
S_{MS} :	1.25	S_S :	1.1
S_{M1} :	0.76	S_1 :	0.31
S_{DS} :	0.84	V_{S30} :	260
S_{D1} :	0.51		

Seismic Design Category: D

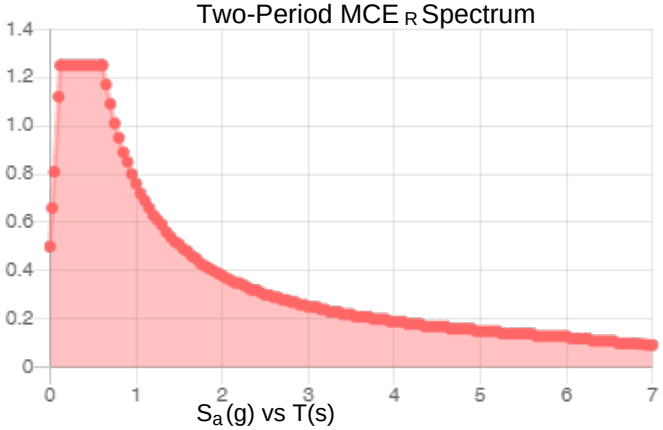
Multi-Period MCE_R Spectrum



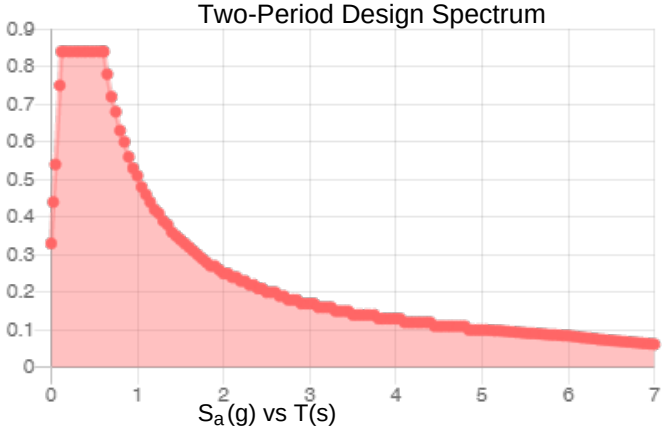
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: Tue Nov 15 2022

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

Appendix E
Structural Load Information

From: Paul Montgomery <paul@a-mce.com>
Sent: Thursday, December 8, 2022 9:32 AM
To: Michael Browne <mbrowne@pioneer-technical.com>
Subject: Re: bore hole tests

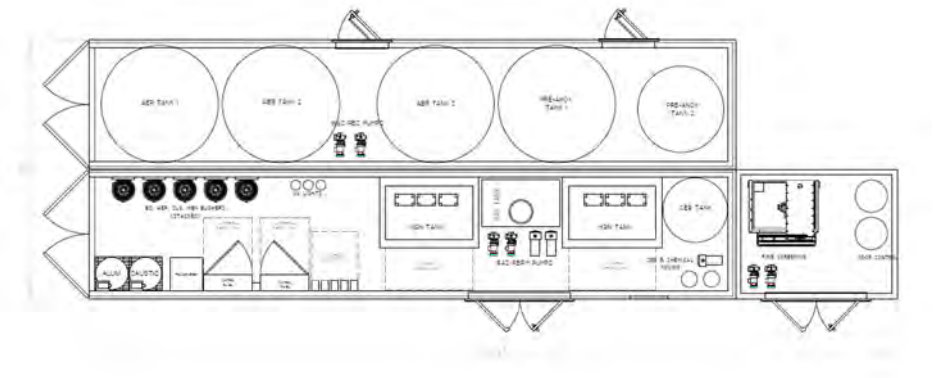
Hey Mike,

I saw there were a couple unanswered questions on Flathead Lake that you're probably waiting for.....

1. WWTP dimensions: we have a pretty solid layout for the above-ground structure - 16' wide and 50' long:

tank side weight = 100,000 lb (around 312 lb/sqft); process side weight = 30,000 lb; screen weight = 8,500 lb
There will be two buried concrete tanks located outside the building footprint:

- 6,000 gallon EQ tank (footprint - 18'x9') = 71,200 lb full;
- 27,000 gallon sludge holding tank (footprint - 18'x24') = 310,000 lb full



Our concept is that the building will sit on a granular cushion rather than a concrete slab..... this is by recommendation of the manufacturer. We'd have concrete aprons outside of all the doors and probably have a concrete driveway extending from the double doors.

Respectfully,

Paul Montgomery, P.E., President

Anderson-Montgomery Consulting Engineers, Inc.

1064 N. Warren St.

Helena, MT 59601

APPENDIX D

Asbestos Report

ARC ENVIRONMENTAL ENTERPRISES INC.
PO BOX 408.
Stevensville Mt.59870
Missoula- 360-8639
Kalispell- 471-5105 Bozeman 599-7438
e-mail: arc.milan@yahoo.com

6 October 2023

Project name: Yellow Bay Biological Station , Polson, MT

The enclosed report details results for analysis of the bulk samples collected by ARC Env asbestos inspector license # MTA 0962 exp. 2/17/2024 for the purpose of finding out if any tested construction materials slated for demolition or renovation contain asbestos.

All the samples at the Lift station that were tested showed no asbestos detected

ARC Env. Enterprises, Inc. Milan Plachy

eurofins | Built Environment Testing Reservoirs

September 28, 2023

Subcontractor Number:
Laboratory Report: **RES 578562-1**
Project #/P.O. #: **Lift Station**
Project Description: **Flathead Biological Station, Yellow Bay, Montana**

Milan Plachy
ARC Environmental Enterprises
1065 Park Ln.
Stevensville MT 59870

Dear Milan,

Eurofins Reservoirs is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 101896-0 for Transmission Electron Microscopy (TEM) and Polarized Light Microscopy (PLM) analysis and the American Industrial Hygiene Association (AIHA LAP, LLC), Lab ID 101533 for Phase Contrast Microscopy (PCM) analysis. This laboratory is currently proficient in both Proficiency Testing and PAT programs respectively.

Eurofins Reservoirs has analyzed the following samples for asbestos content as per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the attached analysis table. The results have been submitted to your office.

RES 578562-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Eurofins Reservoirs will not discuss any part of this study with personnel other than those of the client. The results described in this report only apply to the samples analyzed, as received and with the information provided by the customer. This report must not be used to claim endorsement of products or analytical results by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without written approval from Eurofins Reservoirs. Samples will be disposed of after sixty days unless longer storage is requested. If you have any questions about this report, please feel free to call 303-964-1986.

Sincerely,

Jeanne Spencer
by Abigayle Call

Jeanne Spencer
President

DATA QA
09/28/2023

EUROFINS RESERVOIRS ENVIRONMENTAL, INC

NVLAP Lab Code 101896-0
AIHA LAP, LLC. LAB ID 101533

TABLE: I ANALYSIS: PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number: **RES 578562-1**
Client: **ARC Environmental Enterprises**
Client Project/P.O.: **Lift Station**
Client Project Description: **Flathead Biological Station, Yellow Bay, Montana**
Date Samples Received: **September 25, 2023**
Analysis Type: **EPA 600/R-93/116 - Short Report, Bulk**
Turnaround: **Standard**
Date Samples Analyzed: **September 28, 2023**

NA = Not Analyzed
NR = Not Received
ND = None Detected
TR = Trace; <1 % Visual Estimate
Trem-Act = Tremolite-Actinolite

Laboratory Sample ID / Client Sample Number	LAYER	Physical Description	Sub Part (%)	Asbestos Content: Mineral	Asbestos Content: Visual Estimate (%)	Non-Asbestos Fibrous Components (%)	Non-Fibrous Components (%)
578562 - Main Level Floor - 1	A	Gray granular material	100		ND	0	100
578562 - Main Level Floor - 2	A	Gray granular cementitious material	100		ND	0	100
578562 - Main Level Floor - 3	A	Gray granular cementitious material w/ yellow paint	100		ND	0	100
578562 - Main Level Wall - 1	A	Gray granular material	100		ND	0	100
578562 - Main Level Wall - 2	A	Gray granular cementitious material	100		ND	0	100
578562 - Main Level Wall - 3	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level - 1	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level - 2	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level - 3	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level Wall - 1	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level Wall - 2	A	Gray granular cementitious material	100		ND	0	100
578562 - Bottom Level Wall - 3	A	Gray granular material	44		ND	0	100
	B	Gray granular cementitious material	56		ND	0	100
578562 - Bottom Level Floor - 1	A	Off white granular material	100		ND	0	100
578562 - Bottom Level Floor - 2	A	Off white granular material	100		ND	0	100
578562 - Bottom Level Floor - 3	A	Off white granular material	100		ND	0	100

TEM Analysis recommended for organically bound material (i.e. floor tile) if PLM results are <1%.

EUROFINS RESERVOIRS ENVIRONMENTAL, INC

NVLAP Lab Code 101896-0
AIHA LAP, LLC. LAB ID 101533

TABLE: I ANALYSIS: PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

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Turnaround: **Standard**
Date Samples Analyzed: **September 28, 2023**

NA = Not Analyzed
NR = Not Received
ND = None Detected
TR = Trace; <1 % Visual Estimate
Trem-Act = Tremolite-Actinolite

Laboratory Sample ID / Client Sample Number	LAYER	Physical Description	Sub Part (%)	Asbestos Content: Mineral	Asbestos Content: Visual Estimate (%)	Non-Asbestos Fibrous Components (%)	Non-Fibrous Components (%)
578562 - Outside Wall - 1	A	Gray granular material	30		ND	0	100
	B	Gray granular cementitious material	70		ND	0	100
578562 - Outside Wall - 2	A	Gray granular cementitious material	100		ND	0	100
578562 - Outside Wall - 3	A	Gray granular cementitious material	100		ND	0	100

TEM Analysis recommended for organically bound material (i.e. floor tile) if PLM results are <1%.

Abigayle Call
Analyst

eurofins | Built Environment Testing Reservoirs

RES Job #: 578562

SUBMITTED BY		INVOICE TO		CONTACT INFORMATION		SERIES
Company:	ARC Environmental Enterprises	Company:	ARC Environmental Enterprises	Contact:	Milan Plachy	-1 PLM Standard
Address:	1065 Park Ln.	Address:	1065 Park Ln.	Phone:	(406) 360-8639	
				Fax:		
	Stevensville, MT 59870		Stevensville, MT 59870	Cell:		
Project Number and/or P.O. #:	Lift Station			Final Data Deliverable Email Address:		
Project Description/Location:	Flathead Biological Station, Yellow Bay, Montana			arc.milan@yahoo.com (+ 1 ADDNL. CONTACTS)		

ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm & Sat. 8am - 5pm

PLM / PCM / TEM DTL RUSH PRIORITY STANDARD

CHEMISTRY LABORATORY HOURS: Weekdays: 8am - 5pm

Dust RUSH PRIORITY STANDARD

Metals RUSH PRIORITY STANDARD *PRIOR NOTICE REQUIRED FOR SAME DAY TAT

Organics* SAME DAY RUSH PRIORITY STANDARD

MICROBIOLOGY LABORATORY HOURS: Weekdays: 8am - 5pm

Viable Analysis** PRIORITY STANDARD **TAT DEPENDENT ON SPEED OF MICROBIAL GROWTH

Medical Device Analysis RUSH STANDARD

Mold Analysis RUSH PRIORITY STANDARD

****Turnaround times establish a laboratory priority, subject to laboratory volume and are not guaranteed. Additional fees apply for afterhours, weekends and holidays.****

Special Instructions:

VALID MATRIX CODES

Air = A	Bulk = B
Dust = D	Food = F
Paint = P	Soil = S
Surface = SU	Swab = SW
Tape = T	Wipe = W
Drinking Water = DW	
Waste Water = WW	
ASTM E1792 approved wipe media only	

Client Sample ID Number (Sample ID's must be unique)	ASBESTOS: PLM - PLM Short Report (EPA/600/R-93/116)	ASBESTOS: TEM - AHERA (+/- or Quantified), Microvac (+/- or Quantified), Wipe (+/- or Quantified), NIOSH 7402, Yamate Level II, ISO 10312, ISO 13794, Chatfield, Drinking Water, Waste Water, Bulk +/- CARB Modified Ahera	ASBESTOS: PCM - 7400A, 7400B, OSHA	CHEMISTRY: DUST - Total, Respirable	CHEMISTRY: METALS - Analyte(s) Lead Only (7082, 7420, Waste Water, Foodware), Multi Metals (7303,6020A, 200.8, Waste Water, Foodware, OSHA ID-125G), pH (Liquid or Non-Liquid), TCLP, RCRA 8 Scan, Welding Fume Scan, Full Metals Scan	CHEMISTRY: ORGANICS - Methamphetamine, TSS	MICROBIOLOGY: VIABLES - Campylobacter, Bacillus, Salmonella (Culturable or 1-2), Listeria, E. coli O157:H7, E. coli/Coliforms - Plated, S.aureus, Yeast & Mol, Aerobic Plate Count, Coliforms/E. coli - (State Water, Drinking Water, Non-Drinking Water, +/- Quantification), Lactic Acid, Viable Microbial Count (wo/ID or w/ID), Enterococcus (+/- or Quantification), Legionella (P, NP, C)	MICROBIOLOGY: MEDICAL - Bioburden, LAL	MICROBIOLOGY: MOLD - Spore Trap, Bulk Mold, Particulate Identification	ICO	Sample Volume (L) / Area	Length(or Aliquots) x Width(or Area per Aliquot)	Matrix Code	# of Containers	Date Collected mm/dd/yy	Time Collected hh:mm	Laboratory Analysis Instructions
1 Main Level Floor - 1	X												B				
2 Main Level Floor - 2	X												B				
3 Main Level Floor - 3	X												B				
4 Main Level Wall - 1	X												B				
5 Main Level Wall - 2	X												B				
6 Main Level Wall - 3	X												B				
7 Bottom Level - 1	X												B				
8 Bottom Level - 2	X												B				
9 Bottom Level - 3	X												B				
10 Bottom Level Wall - 1	X												B				
11 Bottom Level Wall - 2	X												B				
12 Bottom Level Wall - 3	X												B				
13 Bottom Level Floor - 1	X												B				

EREI establishes a unique Lab Sample ID, for each sample, by preceding each unique Client Sample ID with the laboratory RES Job Number.
EREI will analyze incoming samples based on information received and will not be responsible for errors or omissions in calculations resulting from the inaccuracy of original data. By signing, client/company representative agrees that submission of the following samples for requested analysis as indicated on this Chain of Custody shall consitute an analytical services agreement with payment terms of NET 30 days. Failure to comply with payment terms may result in a 1.5% monthly interest surcharge.

Relinquished By:		Date/Time:	Sample Condition: Acceptable
Received By:	 Jessica Parker	Date/Time: 09/25/2023 12:37:16	Carrier: UPS

eurofins | Built Environment Testing Reservoirs

RES Job #: **578562**

Submitted By: **ARC Environmental Enterprises**

	REQUESTED ANALYSIS														VALID MATRIX CODES							LAB NOTES
															Air = A				Bulk = B			
															Dust = D				Food = F			
															Paint = P				Soil = S			
															Surface = SU				Swab = SW			
															Tape = T				Wipe = W			
															Drinking Water = DW							
															Waste Water = WW							
															ASTM E1792 approved wipe media only							
Client Sample ID Number (Sample ID's must be unique)	**PLM - PLM Short Report (EPA/600/R-93/116)**	**TEM** - AHERA (+/- or Quantified), Microvac (+/- or Quantified), Wipe (+/- or Quantified), NIOSH 7402, Yamate Level II, ISO 10312, ISO 13794, Chatfield, Drinking Water, Waste Water, Bulk +/-, CARB Modified Ahera	**PCM** - 7400A, 7400B, OSHA	**DUST** - Total, Respirable	**METALS** - Analyte(s) Lead Only (7082, 7420) ,Waste Water, Foodware), Multi Metals (7303,6020A, 200.8, Waste Water, Foodware, OSHA ID-125G), pH (Liquid or Non-Liquid), TCLP, RCRA 8 Scan, Welding Fume Scan, Full Metals Scan	**ORGANICS** - Methamphetamine, TSS	**VIABLES** - Campylobacter, Bacillus, Salmonella (Culturable or 1-2), Listeria, E.coli O157:H7, E.coli/Coliforms - Plated, S.aureus, Yeast & Mol, Aerobic Plate Count, Coliforms/E.coli - (State Water, Drinking Water, Non-Drinking Water, +/-, Quantification), Lactic Acid, Viable Microbial Count (wo/ID or w/ID), Enterococcus (+/- or Quantification), Legionella (P, NP, C)	**MEDICAL** - Bioburden, LAL	**MOLD** - Spore Trap, Bulk Mold, Particulate Identification	ICO	Sample Volume (L) / Area	Length(or Aliquots) x Width(or Area per Aliquo	Matrix Code	# of Containers	Date Collected mm/dd/yy	Time Collected hh:mm	Laboratory Analysis Instructions
	ASBESTOS			CHEMISTRY			MICROBIOLOGY															
14 **Bottom Level Floor - 2**	X																B					
15 **Bottom Level Floor - 3**	X																B					
16 **Outside Wall - 1**	X																B					
17 **Outside Wall - 2**	X																B					
18 **Outside Wall - 3**	X																B					