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AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between City of Sandpoint, Idaho ("Owner") and Simco Development Group, LLC ("Contractor").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The project can be summarized to include a complete reconstruction of 2 City of Sandpoint lift stations; one at City Beach and the other along Superior St West of Iberian Way. The work generally includes the demolition and replacement of 2 lift stations, installation of related appurtenances and instrumentation, and site restoration and cleanup.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

City of Sandpoint – 2024 Lift Station Replacements

ARTICLE 3—ENGINEER

3.01 The Owner will assume all duties and responsibilities of Engineer, and have rights and authority assigned to Engineer in the Contract.

3.02 The project has been designed by the Owner's consultant Keller Associates.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially complete on or before **June 11, 2025**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **July 12, 2025**.

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4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner $500.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $250.00 for each day that expires after such time until the Work is completed and ready for final payment.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 30th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments

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previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. 95 percent of the value of the Work completed (with the balance being retainage).

b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

A. All amounts not paid when due will bear interest at the rate of 6% percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
   a. Performance bond (together with power of attorney).
   b. Payment bond (together with power of attorney).
3. Standard General Conditions, EJCDC C-700 (2018 Edition).
4. Supplementary Conditions.
5. Specifications (not attached but incorporated by reference) consisting of the Idaho Standards for Public Works Construction (ISPWC – 2020 Edition), excluding Division 100.
6. Special Provisions.
7. Drawings consisting of **36** sheets with each sheet bearing the following general title: **2024 Lift Stations Replacements.**
8. Addendum No. 1.
9. Contractor's Bid
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.

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b. Work Change Directives.

c. Change Orders.

d. Field Orders.

e. Warranty Bond, if any.

11. In the event of inconsistency between the Contract Documents, the Contract Documents shall be interpreted in accordance with the listed priorities set forth in this provision, i.e, requirements of item 1 shall supersede all lower ranked items.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the drawings.

5. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

6. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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7. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
8. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
9. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
10. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.
11. The Contractor is an appropriately licensed public works contractor per Idaho Code Section 54-1902.
12. Contractor shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring the Contractor's compliance with any Laws or Regulations.

8.02 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on September 19, 2024 (which is the Effective Date of the Contract).

Owner: City of Sandpoint	Contractor: Simco Development Group LLC
(typed or printed name of organization)	*(typed or printed name of organization)*
By:	By: DocuSigned by: Jason Simmons CBE249EFEB59462
(individual's signature)	*(individual's signature)*
Date:	Date: 9/9/2024
(date signed)	*(date signed)*
Name: Jeremy Grimm	Name: Jason Simmons
(typed or printed)	*(typed or printed)*
Title: Mayor	Title: Member
(typed or printed)	*(typed or printed)*
	*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest:	Attest:
(individual's signature)	*(individual's signature)*
Title:	Title:
(typed or printed)	*(typed or printed)*
Address for giving notices:	Address for giving notices:
City Clerk	10183 N Aero Drive Suite 4
1123 Lake Street	Hayden Idaho 83835
Sandpoint, ID 83864	
Designated Representative:	Designated Representative:
Name: Erik Bush	Name: Jason Simmons
(typed or printed)	*(typed or printed)*
Title: Construction Manager	Title: Member
(typed or printed)	*(typed or printed)*
Address:	Address:
1123 Lake Street	Po Box 2023
Sandpoint, ID 83864	Hayden Idaho 83835
Phone: 208-946-2062	Phone: 208 719 0245
Email: ebush@sandpointidaho.gov	Email: Mary@simcodg.com
*(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	License No.: 028733-AA *(where applicable)*
	State: Idaho

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

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requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

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33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

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43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

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1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

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F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

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into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

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ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

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inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

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B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

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established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

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D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

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B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

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and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

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Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

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3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

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or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

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of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

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conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

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Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

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Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

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L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

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4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

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Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

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6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

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B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

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2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

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3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

    a. will certify that the proposed substitute item will:

        1) perform adequately the functions and achieve the results called for by the general design;

        2) be similar in substance to the item specified; and

        3) be suited to the same use as the item specified.

    b. will state:

        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

        2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

        3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

    c. will identify:

        1) all variations of the proposed substitute item from the item specified; and

        2) available engineering, sales, maintenance, repair, and replacement services.

    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

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H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

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7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

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7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

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I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

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3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

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document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

   a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

   b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

   c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

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d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

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9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

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D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

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E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

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B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

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9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

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ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

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E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

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ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

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B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

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1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or
2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
    b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
    c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
    d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
    f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

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11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

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Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

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and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

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2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

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consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

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g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

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Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

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thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

   a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

   b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

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losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

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or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

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establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

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4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
    a. to supervise, direct, or control the Work;
    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
    a. the Work is defective, requiring correction or replacement;
    b. the Contract Price has been reduced by Change Orders;
    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
    e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

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b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

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submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

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significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
    a. all documentation called for in the Contract Documents;
    b. consent of the surety, if any, to final payment;
    c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

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d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

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appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

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attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

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provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

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18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01 Delete Paragraph 1.01.A.46.c in its entirety and replace with the following:

46.c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

SC-1.01 Add the following immediately after Paragraph 1.01.A.50:

51. *Special Provisions* - The part of the Contract that amends or supplements the Specifications.

52. *Request for Information* – A written request for information or clarification, requiring a written response to Owner, Engineer, or Contractor, initiated by Owner, Engineer, or Contractor.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

A. Owner shall furnish to Contractor **[1]** printed copy of conformed Contract Documents incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully signed counterpart of the Agreement). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

2.03 *Before Starting Construction*

SC-2.03 Delete Paragraph 2.03.A.1 in its entirety and replace with the following:

1. A detailed Progress Schedule in Gantt chart format or similar used to plan, coordinate, and control the progress of construction and shall include the following:

   a. provide for orderly, timely, and efficient prosecution of the Work;

   b. contain sufficient detail to enable both the Contractor and the Engineer to plan,

   coordinate, and control their respective Contract responsibilities

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c. sufficient detail for each Bid Item of Work, at a minimum, and indicate the durations, dates for starting and completing the various stages of the Work, and including subcontractor work; and,

d. durations and relationships of required submittals, major material procurement lead times, permitting, traffic control, and any utility coordination.

2.05 *Acceptance of Schedules*

SC-2.05 Delete Paragraph 2.05.A in its entirety and replace with the following:

A. No Work on Site shall begin until acceptable schedules are submitted to Owner and Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times and meets the requirements of the Contract. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 3 days to revise and resubmit the schedule.

SC-2.05 Add the following immediately after Paragraph 2.05.A:

B. Acceptance of the Progress Schedule will provide an overall baseline for progressing the Work and be supplemented with a "look-ahead" Work schedule each week to the Engineer. The "look-ahead" Project Work schedule will be presented in a bar chart that shows at least three weeks of activity including the week the bar chart is issued with the largest time scale unit of 1 calendar day (smaller scales may be used) representing each activity that will be done including the location/limits of the Work. The first "look-ahead" schedule will be provided within one week after acceptance of the Progress Schedule.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

SC-3.01 Delete Paragraph 3.01.C in its entirety.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.05 *Delays in Contractor's Progress*

SC-4.05 Amend Paragraph 4.05.C by adding the following subparagraphs:

5. *Weather-Related Delays*

a. If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract

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Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled.

b. The existence of abnormal weather conditions will not relieve Contractor of the obligation to demonstrate and document that delays caused by abnormal weather are specific to the planned work activities or that such activities thus delayed were on Contractor's then-current Progress Schedule's critical path for the Project.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.02 *Use of Site and Other Areas*

SC-5.02 Delete Paragraph 5.02.A.2 and insert the following paragraph in its place:

A. 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, defend, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

5.03 *Subsurface and Physical Conditions*

SC-5.03 Delete Paragraph 5.03A in its entirety and replace with the following:

A. *Reports and Drawings*: No reports or drawings related to explorations and tests of subsurface conditions or existing physical conditions at or adjacent to the Site are known by Owner.

5.04 *Differing Subsurface or Physical Conditions*

SC-5.04 Delete Paragraph 5.04.A in its entirety and replace with the following:

A. Notice by Contractor: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions

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or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

5.06 *Hazardous Environmental Conditions*

SC-5.06 Delete Paragraph 5.06A and 5.06B in its entirety and replace with the following:

A. *Reports and Drawings:* No reports or drawings related to Hazardous Environmental Conditions at the Site are known by Owner.

B. Not used.

SC-5.06 Delete Paragraph 5.06.J and insert the following paragraph in its place:

To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for Whom Contractor is responsible. Nothing in Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

ARTICLE 6—BONDS AND INSURANCE

6.02 *Insurance—General Provisions*

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.B:

1. Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the Project is located, (b) is certified or authorized as a worker's compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.D:

1. All certificates of insurance shall name as additionally insured:

    a. Owner: City of Sandpoint

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap

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employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions). All insurance policies shall contain a Waiver of Subrogation coverage or endorsements.

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory

F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
    a. Such insurance must be maintained for three years after final payment.
    b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

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7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
8. All policies shall contain waiver of subrogation coverage or endorsements.

H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
6. Any limitation or exclusion based on the nature of Contractor's work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	**Policy limits of not less than:**
General Aggregate	$2,000,000.00
Products—Completed Operations Aggregate	$2,000,000.00
Personal and Advertising Injury	$1,000,000.00
Bodily Injury and Property Damage—Each Occurrence	$1,000,000.00

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	**Policy limits of not less than:**
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000.00

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

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Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$2,000,000.00
General Aggregate	$2,000,000.00

L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein.

M. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
General Aggregate	$1,000,000.00

N. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$500,000.00
Annual Aggregate	$1,000,000.00

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Delete Paragraphs 6.04.B and 6.04.C in their entirety and add the following immediately after Paragraph 6.04.E:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and

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artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.

b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.

2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).

4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

5. extend to cover damage or loss to insured property while in transit.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.

9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.

10 include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."

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ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

SC-7.03 Delete Paragraph 7.03.C in its entirety, and insert the following:

C. Contractor may perform the Work at the Site only between the hours of 7AM and 7PM, Monday thru Friday unless otherwise authorized by the Owner in writing.

7.09 *Permits*

SC-7.09 Add the following immediately after Paragraph 7.09.A:

B. Contractor and any subcontractors shall obtain a City of Sandpoint Business License prior to mobilization.

7.10 *Taxes*

SC-7.10 Add the following paragraph immediately after Paragraph 7.10.A:

B. In the event of the Contractor's default on the payment of taxes, excises, and license fees as set forth in Idaho Code 63-1503, the Owner shall have the authority to withhold from any payment due the Contractor under this contract, the estimated amount of such accrued and accruing taxes, excises, and license fees for the benefit of all taxing authorities to which said Contractor is liable.

7.11 *Laws and Regulations*

SC-7.11 Add the following paragraph immediately after Paragraph 7.11.C:

D. While not intended to be inclusive of all Laws or Regulations for which Contractor may be responsible under paragraph 6.09, the following Laws or Regulations are included as mandated by statute or for the convenience of the Contractor;

1. **Idaho Code Section 63-1501. Definitions.** As used in this act, the following terms shall have the following meanings:

   "Contracting units" shall include the state or any officer or department thereof, the counties or other subdivisions of the state, and all municipal and quasi-municipal corporations therein.

   "Contractor" shall mean any person, firm, co-partnership, association, or corporation, foreign or domestic, entering into a contract for the construction, erection, repair, or improvement of any kind or character of public works in this state.

   "Taxes" shall mean all taxes, assessments, excises, and license fees authorized to be levied, assessed, and collected under the laws of this state, other than taxes on real property.

   "Taxing unit" shall mean the state or any officer or department thereof, the counties or other subdivisions of the state, and all municipal and quasi-municipal corporations therein authorized by law to assess, levy and collect taxes.

2. **Idaho Code Section 63-1502. Conditions precedent to contract for public works.** Before entering into a contract for the construction of any public works in this state, the contracting unit shall require as conditions precedent that the contractor be authorized

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to do business in this state and that he furnish satisfactory evidence that he has paid or secured to the satisfaction of the respective taxing units all taxes for which he or his property is liable then due or delinquent.

3. **Idaho Code Section 63-1503. Contractor for public works to pay or secure taxes—Agreement.** Every contract for the construction of public works by a contracting unit of this state shall contain substantially the following provisions:

The Contractor, in consideration of securing the business of erecting or constructing public works in this state, recognizing that the business in which he is engaged is of a transitory character, and that in the pursuit thereof, his property used therein may be without the state when taxes, excises, or license fees to which he is liable become payable, agrees:

a. To pay promptly when due all taxes (other than on real property), excises and license fees due to the state, its subdivisions, and municipal and quasi-municipal corporations therein accrued or accruing during the term of this contract, whether or not the same shall be payable at the end of such term;

b. That if the said taxes, excises, and license fees are not payable at the end of said term, but liability for the payment thereof exists, even though the same constitute liens upon his property, to secure the same to the satisfaction of the respective officers charged with the collection thereof; and

c. That in the event of his default in the payment or securing of such taxes, excises, and license fees, to consent that the department, officer, board, or taxing unit entering into this contract may withhold from any payment due him hereunder the estimated amount of such accrued and accruing taxes, excises, and license fees for the benefit of all taxing units to which said contractor is liable.

4. **Idaho Code Section 44-1002** requires the following: The Contractor must employ ninety-five percent (95%) bona fide Idaho residents as employees on any job under any such contract except where under such contracts fifty (50) or less persons are employed, the Contractor may employ ten percent (10%) nonresidents, provided, however, in all cases employers must give preference to the employment of bona fide residents in the performance of said work, and no contract shall be let to any person, firm, association, or corporation refusing to execute an agreement with the above mentioned provisions in it; provided, that, in contracts involving the expenditure of federal aid funds this act shall not be enforced in such a manner as to conflict with or be contrary to the federal statutes prescribing a labor preference to honorably discharged soldiers, sailors, and marines, prohibiting as unlawful any other preference or discrimination among citizens of the United States.

5. **Idaho Code Chapter 19 of Title 54** requires proper licensing of Public Works Contractors.

7.18 *Indemnification*

SC-7.18 Delete Paragraph 7.18.A in its entirety and insert the following paragraph in its place:

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners,

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employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property)other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

ARTICLE 8—OTHER WORK AT THE SITE

No Supplementary Conditions in this Article.

ARTICLE 9—OWNER'S RESPONSIBILITIES

No Supplementary Conditions in this Article.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.02 *Visits to Site.*

SC-10.02 Delete Paragraphs 10.02 in its entirety.

10.03 *Resident Project Representative.*

SC-10.03 Delete Paragraphs 10.03 in its entirety.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

SC-11.01 Delete Paragraph 11.01.C in its entirety and insert the following in its place:

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by CWE's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of CWE.

ARTICLE 12—CLAIMS

No Supplementary Conditions in this Article.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.03 *Unit Price Work*

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SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

   a. the extended price of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

   b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCCEPTANCE OF DEFECTIVE WORK

No Supplementary Conditions in this Article.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

No Supplementary Conditions in this Article.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

No Supplementary Conditions in this Article.

ARTICLE 18—MISCELLANEOUS

18.07 *Controlling Law*

SC-18.07 Delete Paragraph 18.07 in its entirety and insert the following paragraph in its place:

This Contract is to be governed by the law of the State of Idaho. The jurisdiction/venue for any action arising out of performance of this Contract, or interpretation of its terms and conditions, shall be in the District Court in the First Judicial District of the State of Idaho, Bonner County. In any action to enforce the terms and conditions of this Contract, the prevailing party may recover its reasonable attorney fees.

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Add the following Article 19 – Prosecution of the Work, immediately following Article 18 - Miscellaneous.

ARTICLE 19—PROSECUTION OF THE WORK

SC-19.01 *General*

A. From the time of commencement of the Work to the time of Final Acceptance the Contractor shall: provide adequate Materials, Equipment, labor, and supervision to perform and complete the Work; perform the Work as vigorously and as continuously as conditions permit, and according to a Project Work schedule that ensures completion within the Contract Time or the adjusted Contract Time; not voluntarily suspend or slow down operations without prior written approval from the Engineer; and not resume suspended Work without the Engineer's written authorization.

SC-19.02 *Cost Reduction Proposals*

B. The Contractor may submit written proposals to the Engineer that modify Plans, Specifications, or other Contract Documents for the sole purpose of reducing the total cost of construction. Unless otherwise agreed to in writing, a proposal that is solely or primarily a proposal to reduce estimated quantities or delete Work, is not eligible for consideration as a cost reduction proposal.

C. Proposal Requirements - The Engineer will not adopt a cost reduction proposal that impairs essential functions or characteristics of the Project, including, but not limited to, service life, economy of operation, ease of maintenance, designed appearance, or design and safety standards.

To conserve time and funds, the Contractor may first submit a written request for a feasibility review by the Engineer. The request should contain a description of the proposal together with a rough estimate of anticipated dollar and time savings. The Engineer will, within a reasonable time, advise the Contractor in writing whether or not the proposal would be considered by the Engineer, should the Contractor elect to submit a detailed cost reduction proposal.

D. A detailed cost reduction proposal shall include without limitation the following information:

1. A description of existing Contract requirements for performing the Work and the proposed change;
2. The Contract items of Work affected by the proposed change, including any quantity variation caused by the proposed change;
3. Pay Items affected by the proposed change including any quantity variations;
4. A detailed cost estimate for performing the Work under the existing Contract and under the proposed change.

Costs of re-design, which are incurred after the Engineer has accepted the proposal, shall be included in the cost of proposed work; and a date by which the Engineer must accept the proposal in order to accept the proposed change without impacting the Contract Time or cost reduction amount.

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E. Continuing to Perform Work - The Contractor shall continue to perform the Work according to Contract requirements until the Engineer issues a Change Order incorporating the cost reduction proposal. If the Engineer fails to issue a Change Order by the date specified in the proposal, the proposal shall be deemed rejected.

F. Consideration of Proposal - The Engineer is not obligated to consider any cost reduction proposal. The Engineer will not be liable to the Contractor for failure to accept or act upon any cost reduction proposal submitted. The Engineer will determine in its sole discretion whether to accept a cost reduction proposal as well as the estimated net savings in construction costs from the adoption of all or any part of the proposal. In determining the estimated net savings, the Engineer may disregard the Schedule of Items. The Engineer will establish prices that represent a fair measure of the value of Work to be performed or to be deleted as a result of the cost reduction proposal.

G. Sharing Investigation Costs - As a condition for considering a Contractor's cost reduction proposal, the Engineer reserves the right to require the Contractor to share in the Engineer's costs of investigating the proposal. If the Engineer exercises this right, the Contractor shall provide written acceptance of the condition to the Engineer. Such acceptance will authorize the Engineer to deduct its share of investigation costs from payments due or that may become due to the Contractor under the Contract.

H. Acceptance of Proposal Requirements - If the Contractor's cost reduction proposal is accepted in whole or in part, acceptance will be made by a Change Order. The Contractor's cost of preparing the cost reduction proposal and the Engineer's costs of investigating the proposal, including any portion paid by the Contractor, will be excluded from determination of the estimated net savings in construction costs. Costs of re-design, which are incurred after the Engineer has accepted the proposal, will be included in the cost of the Work attributable to cost reduction measures. If the Engineer accepts the cost reduction proposal, the Change Order that authorizes the cost reduction measures will also address any Contract Time adjustment.

SC-19.03 *Force Account Work*

The Materials, Equipment and labor rates and procedures established in this Section apply to Extra Work ordered by the Engineer to be performed as Force Account Work.

A. Extra Work on a Force Account Basis - Before ordering Force Account Work, the Engineer will discuss the proposed work with the Contractor, and will seek the Contractor's comments and advice concerning the formulation of Force Account Work specifications. The Engineer is not bound by the Contractor's comments and advice, and has final authority to: determine and direct the Materials, Equipment and labor to be used on the approved Force Account Work and to determine the time of the Contractor's performance of the ordered Force Account Work.

B. If the Engineer orders the performance of Extra Work as Force Account Work, the Engineer will record, on a daily basis, the Materials, Equipment, labor, and Special Services used for the Force Account Work during that day. The Engineer and the Contractor shall sign the record daily to indicate agreement on the Materials, Equipment, labor, and Special Services used for the Force Account Work performed on that day.

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C. The Owner will not be responsible for additional costs that are a direct or indirect result of the Contractor's inefficient means and methods or that reasonably could have been avoided if the Materials, Equipment, labor or services had been obtained at a more commercially reasonable cost.

D. Payment for Force Account Work shall be negotiated and agreed upon by Change Order.

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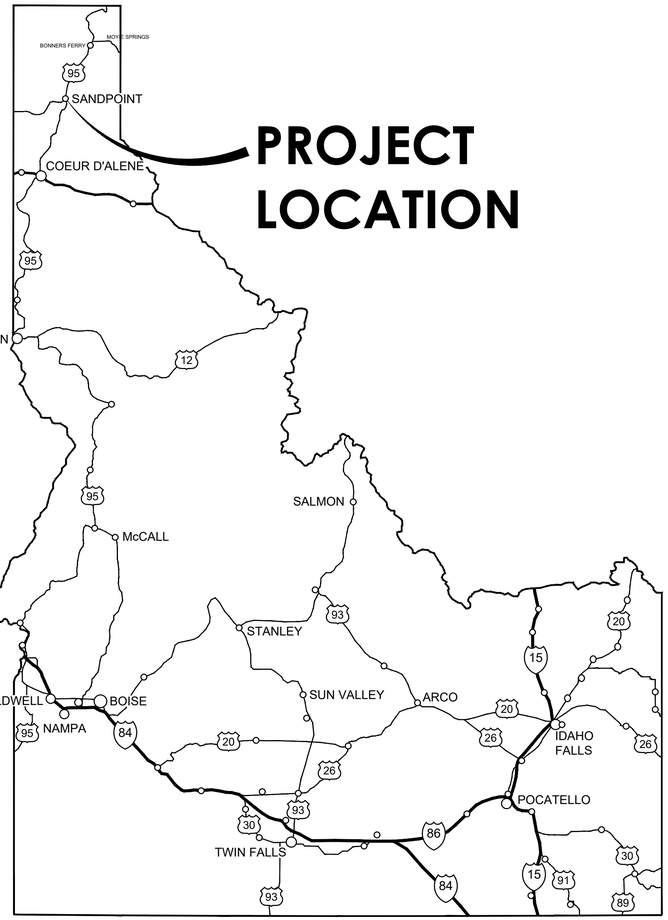
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City of

SANDPOINT, IDAHO

LIFT STATION REPLACEMENTS

AUGUST - 2024



PROJECT LOCATION

A1 LOCATION MAP
N.T.S.

OWNER
CITY OF SANDPOINT
1123 W. LAKE STREET
SANDPOINT, IDAHO 83864
CONTACT: ERIK BUSH
PHONE: 208-269-5571

CIVIL ENGINEER
KELLER ASSOCIATES, INC.
601 SHERMAN AVE, SUITE 1
COEUR D'ALENE, ID 83814
CONTACT: KYLE MESCHKO, PE
PHONE: (208)758-8601

811
Know what's **below.**
Call before you dig.
800.342.1585



PROJECT SITES

A3 VICINITY MAP
N.T.S.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER
LICENSED
Kyle Meschko
0BE97B4AEF5044EB...
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

TITLE SHEET

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PROJECT NO.	PAGE
223072	

SHEET NO.
G-001

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G-002 - SHEET INDEX
G-003 - PIPING SCHEDULE & DESIGN CRITERIA
G-004 - ABBREVIATIONS
G-005 - ABBREVIATIONS CONT.
G-006 - EQUIPMENT RESPONSIBILITY MATRIX

CIVIL PLANS

GENERAL CIVIL

C-001 - CIVIL SYMBOLS & LINE LEGEND

STRUCTURE A - CITY BEACH LIFT STATION

C-101-A - CITY BEACH LIFT STATION DEMOLITION PLAN
C-102-A - CITY BEACH LIFT STATION SITE & UTILITY PLAN
C-201-A - CITY BEACH LIFT STATION GRADING & DRAINAGE PLAN
M-101-A - CITY BEACH LIFT STATION - MECHANICAL PLAN
M-301-A - CITY BEACH LIFT STATION - MECHANICAL SECTION
E-101-A - CITY BEACH LIFT STATION - POWER PLAN
E-125-A - CITY BEACH LIFT STATION - ELECTRICAL AREA CLASSIFICATION
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EI-101-A - CITY BEACH LIFT STATION - INSTRUMENTATION PLAN
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STRUCTURE B - SUPERIOR LIFT STATION

C-101-B - SUPERIOR STREET LIFT STATION DEMOLITION PLAN
C-102-B - SUPERIOR STREET LIFT STATION SITE & UTILITY PLAN
C-201-B - SUPERIOR STREET LIFT STATION GRADING & DRAINAGE PLAN
M-101-B - SUPERIOR STREET LIFT STATION - MECHANICAL PLAN
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E-125-B - SUPERIOR STREET LIFT STATION - ELECTRICAL AREA CLASSIFICATION
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GENERAL DETAILS

CIVIL DETAILS

C-501 - STANDARD DETAILS
C-502 - STANDARD DETAILS
C-503 - STANDARD DETAILS

MECHANICAL

M-501 - MECHANICAL STANDARD DETAILS

ELECTRICAL

E-001 - ELECTRICAL NOTES & SYMBOLS
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EI-001 - P&ID LEGEND & SCHEDULE
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DISCIPLINE DESIGNATORS

G	GENERAL DRAWINGS
V	SURVEY DRAWINGS
C	CIVIL DRAWINGS
A	ARCHITECTURAL DRAWINGS
S	STRUCTURAL DRAWINGS
MP	PLUMBING DRAWINGS
MH	HVAC DRAWINGS
M	MECHANICAL PROCESS DRAWINGS
E	ELECTRICAL DRAWINGS
EI	ELECTRICAL INSTRUMENTATION DRAWINGS

CIVIL SHEET TYPES

0XX	GENERAL (SYMBOLS LEGEND, NOTES, KEY MAPS, ETC.)
1XX	SITE (TOPOGRAPHY, DEMOLITION, SITE LAYOUTS, ETC.)
2XX	GRADING (GRADING, DRAINAGE, EXCAVATION, ETC.)
3XX	YARD PIPING (PLAN VIEW, PLAN & PROFILES, ETC.)
4XX	ENLARGED VIEWS
5XX	PROJECT DETAILS
6XX	MISCELLANEOUS

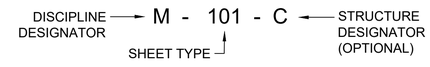
STRUCTURE SHEET TYPES

0XX	GENERAL (SYMBOLS LEGEND, NOTES, ETC.)
1XX	PLANS (HORIZONTAL VIEWS)
2XX	ELEVATIONS (VERTICAL VIEWS)
3XX	SECTIONS (SECTION VIEWS)
4XX	LARGE SCALE VIEWS (PLANS, ELEVATIONS OR SECTIONS)
5XX	PROJECT DETAILS
6XX	SCHEDULES AND DIAGRAMS
7XX	USER DEFINED (FOR TYPES WHICH DO NOT FALL IN OTHER CATEGORIES)

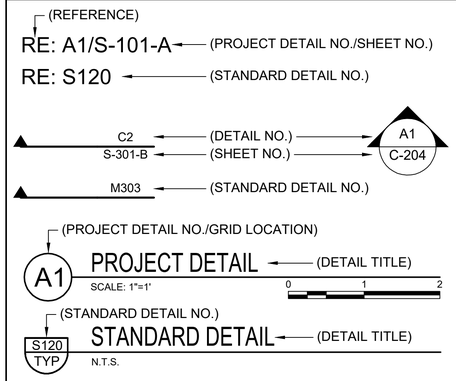
STRUCTURE DESIGNATORS

A	CITY BEACH LIFT STATION
B	SUPERIOR LIFT STATION

SHEET NUMBERING KEY



DETAIL & SECTION CALLOUT KEY



KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED
Docusigned by: Kyle Meschko
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

SHEET INDEX

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SHEET NO. G-002

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PIPING SCHEDULE	
FLUID ABBREV.	**FUNCTION**
DR	DRAIN
PS	PRESSURE SEWER
SD	STORM DRAIN/STORM WATER
SS	SANITARY SEWER
VNT	VENT
W	POTABLE WATER

Design Criteria	
Site A: City Beach Lift Station	
No. of Pumps	2
Pump Type	Submersible Chopper
Flow (gpm)	250
TDH (ft)	34
Motor Size (HP)	7.5
Drive	Constant
Site B: Superior Street Lift Station	
No. of Pumps	2
Pump Type	Submersible Non-Clog
Flow (gpm)	350
TDH (ft)	23
Motor Size (HP)	5.0
Drive	Constant

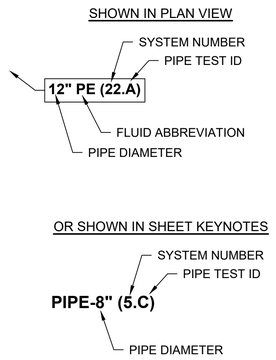
PIPE MATERIALS		
SYSTEM NUMBER	**MATERIAL**	**DETAILS**
5	DUCTILE IRON (DIP)	AWWA C151; EPOXY LINING
6	DUCTILE IRON (DIP)	AWWA C151; CEMENT MORTAR LINING
8	POLYVINYL CHLORIDE (PVC)	ASTM D1784; CLASS 12454-B; ASTM D1785; SCH. 80
9	POLYVINYL CHLORIDE (PVC)	ASTM D1784; CLASS 12454-B; ASTM D1785; NSF CERTIFIED; SCH. 80
11	POLYVINYL CHLORIDE (PVC)	ASTM D1784; CLASS 12454-B; ASTM D2665; SCH. 40
12	POLYVINYL CHLORIDE (PVC)	ASTM D3034; SDR 35
13	POLYVINYL CHLORIDE (PVC)	AWWA C900
20	POLYETHYLENE (HDPE FLEX)	NSF-61 CERTIFIED; BRASS COMPRESSION FITTINGS WITH CURB STOPS
22	STEEL	ASTM A53; GALVANIZED
24	STEEL	ASTM A53; SEAMLESS; GRADE B; BLACK; NO LINING
43	STAINLESS STEEL	ASTM A312; 304L; SEAMLESS; SCHEDULE 10S; WELDED
44	STAINLESS STEEL	ASTM A312; 316L; SEAMLESS; SCHEDULE 10S; WELDED
45	STAINLESS STEEL	ASTM A312; 304L; SEAMLESS; SCHEDULE 20S; WELDED OR THREADED

PIPE TESTING SCHEDULE				
ID	**SPECIFICATION**	**TEST MEDIUM**	**TEST PRESSURE - PSI**	**LEAKAGE ALLOWANCE**
A	01 74 20	AIR	4	PER 01 74 20
B	22 00 00	WATER	4.3	0
C	01 74 30	WATER	150	0
D	01 74 30	WATER	100	0
E	01 74 30	WATER	50	0

GENERAL SHEET NOTES

1. FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.
2. FOR ACCEPTABLE PIPE USAGES, SEE PIPING SECTION OF SPECIFICATIONS.
3. FOR PIPE FITTINGS, SEE PIPING SECTION OF SPECIFICATIONS.
4. ALL MANHOLES SHALL BE TESTED IN ACCORDANCE WITH SECTION 33 05 62.
5. EXPOSED PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS SHALL BE SELECTED BY OWNER.
6. EXPOSED PIPING SHALL BE INSULATED WHERE SHOWN. SEE SPECIFICATIONS FOR INSULATION REQUIREMENTS.
7. BURIED DUCTILE IRON PIPE MUST BE INSTALLED IN POLYETHYLENE SLEEVE.
8. ANY DEVIATION FROM THE PIPING MATERIALS OR FIELD TEST PROCEDURES, IDENTIFIED HEREIN, WILL BE NOTED IN THE SPECIFICATIONS OR ON THE DRAWINGS.

TYPICAL PIPE DESIGNATION



KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED Kyle Meschko 17127 8/6/2024 STATE OF IDAHO KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

PIPING SCHEDULE & DESIGN CRITERIA

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SHEET NO. G-003

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GENERAL ABBREVIATIONS

A

A	-AMPERE
AB	-ANCHOR BOLT
ABI	-ADDITIVE BID ITEM
AC	-ASPHALTIC CONCRETE
	-ACOUSTIC
A/C	-AIR CONDITIONING
ACC	-AREA CONTROL CENTER
ACOU	-ACOUSTIC
ACP	-ASBESTOS
ACT	-ACOUSTICAL CEILING TILE
AD	-ANAEROBIC DIGESTER
ADD	-ADDITION(AL)
ADF	-AVERAGE DESIGN FLOW (AVERAGE DAY, PEAK MONTH)
ADH	-ADHESIVE
ADJ	-ADJUSTABLE
ADPT	-ADAPTER
AF	-AIR FILTER
AFF	-ABOVE FINISHED FLOOR
AHU	-AIR HANDLING UNIT
AL	-ALUMINUM, ALUM
ALP	-AIR LOW PRESSURE
ALT	-ALTERNATE
A/O	-ANOXIC
	-OXIC
AP	-AIR PROCESS
APPX	-APPROXIMATE(LY)
AR	-AIR RETURN
ARV	-AIR RELEASE VALVE
ARCH	-ARCHITECTURAL
AS	-AIR SUPPLY
ASME	-AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	-AMERICAN SOCIETY OF TESTING MATERIALS
ATM	-ATMOSPHERE
AUTO	-AUTOMATIC
AUX	-AUXILIARY
AV	-ANGLE VALVE
AVAR	-AIR VACUUM AND AIR RELEASE
AVE	-AVENUE

B

B	-BOTTOM
B/C	-BOTTOM OF CURB
BAC	-BACTERIOLOGICAL
BC	-BEGINNING OF CURVE
BCR	-BEGINNING OF CURVE CENTER
BD	-BOARD
BF	-BLIND FLANGE
BFP	-BACKFLOW PREVENTER
BFV	-BUTTERFLY VALVE
BHP	-BRAKE HORSEPOWER
BKR	-BREAKER
BLDG	-BUILDING
BLK	-BLOCK
BLVD	-BOULEVARD
BO	-BLOW OFF
BOD	-BIOCHEMICAL OXYGEN DEMAND
BOD5	-BIOCHEMICAL OXYGEN DEMAND, 5 DAY
BOP	-BOTTOM OF PIPE
	-BACK OF PIPE
BOT	-BOTTOM
BP	-POINT OF BEGINNING
BRG	-BEARING
BSN	-BAR SCREEN
BTD	-BIOTOWER DRAIN
BTI	-BIOTOWER INFLUENT
BTU	-BRITISH THERMAL UNIT
BV	-BALL VALVE
BVCE	-BEGIN VERTICAL CURVE ELEVATION
BVCS	-BEGIN VERTICAL CURVE STATION

C

C	-CELSIUS
	-CONDUIT
CAB	-DIRECT BURIAL CABLE
	-CABINET
CAF	-COMBUSTION AIR FAN
CATV	-CABLE TELEVISION
CB	-CATCH BASIN
CBOD5	-CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND, 5 DAY
C/C	-CENTER TO CENTER
CCP	-CONCRETE CYLINDER PIPE
CCSP	-CONCRETE PINED AND COATED STEEL PIPE
CD	-CEILING DIFFUSER
CDF	-CONTROL DENSITY FILL
CDR	-CONDUCTOR
CDS	-CHEMICAL DOSING
CDU	-CONDENSING UNIT
CED	-CEILING EXHAUST DIFFUSER
CER	-CEILING EXHAUST REGISTER
CF	-CUBIC FOOT
CFM	-CUBIC FEET PER MINUTE
CFR	-CODE OF FEDERAL REGULATIONS
CFS	-CUBIC FEET PER SECOND
CH	-CHANNEL
CI	-CAST IRON
CIP	-CAST IRON PIPE
CJ	-CONSTRUCTION JOINT
	-CONTROL JOINT
CK	-CHECKER(ED)
CKPL	-CHECKER PLATE
CKT	-CIRCUIT
CL	-CHLORINE LIQUID
	-CHAIN LINK
	-CLEARANCE
	-CENTERLINE
CL2	-CHLORINE
CLG	-CEILING
CLO	-CHLORINE
CLR	-CLEAR
CLS	-CHLORINE SOLUTION
CMC	-CEMENT MORTAR COATED
CML	-CEMENT MORTAR LINED
CMP	-CORRUGATED METAL PIPE
CMU	-CONCRETE MASONRY UNIT
CND	-CONDUIT
CNTL	-CONTROL
CO	-CLEANOUT
COD	-CHEMICAL OXYGEN DEMAND
COL	-COLUMN
COM	-COMMINUTOR
CON	-CONVEYOR
CONC	-CONCRETE
COND	-CONDITION
CONN	-CONNECTION
CONST	-CONSTRUCTION
CONT	-CONTINUOUS
COTG	-CLEANOUT TO GRADE
CPLG	-COUPLING
CPVC	-CHLORINATED POLYVINYL CHLORIDE
CR	-CIRCLE
CSL	-COMBINED SLUDGE
CT	-CONTACT TIME
CTF	-CENTRIFUGE
CU	-CUBIC
CV	-CHECK VALVE
CV	-CONTROL VALVE
C/W	-COMPLETE WITH
CW	-CULINARY WATER (POTABLE)
CWR	-COOLING WATER RETURN
CWS	-COOLING WATER SUPPLY
CY	-CUBIC YARD

D

DAF/DAFT	-DISSOLVED AIR FLOTATION
DB	-DUCT BANK
	-DOWEL BAR
DBA	-DEFORMED BAR ANCHOR
DBL	-DOUBLE
DEMO	-DEMOLISH
DET	-DETAIL
DF	-DRINKING FOUNTAIN
DI	-DUCTILE IRON
DIA	-DIAMETER
DIAG	-DIAGRAM
DIFF	-DIFFERENTIAL
DIM	-DIMENSION
DIP	-DUCTILE IRON PIPE
DIR	-DIRECTION
DISCH	-DISCHARGE
DO	-DISSOLVED OXYGEN
DR	-DRAIN
DS	-DRUM SCREEN
DTL	-DETAIL
DWF	-DRY WEATHER FLOW
DWG	-DRAWING

E

(E)	-EXISTING
E	-EPOXY
	-EAST
EA	-EACH
	-EXHAUST AIR
ECC	-ECCENTRIC
EF	-EACH FACE
	-EXHAUST FAN
EFF	-EFFLUENT
EG	-EDGE OF GRAVEL
EJ	-EXPANSION JOINT
EL	-ELEVATION
ELEV	-ELEVATION
ELL	-ELBOW
EMBED	-EMBEDMENT
ENG	-ENGINEERED
EOP	-END OF PIPE
EP	-EDGE OF PAVEMENT
EPDM	-ETHYLENE PROPYLENE DIENE MONOMER
EQ	-EQUAL
EQUIP	-EQUIPMENT
EOR	-ENGINEER OF RECORD
EP	-EDGE OF PAVEMENT
EQ	-EQUAL
	-EQUATION
	-EQUALIZATION
EVCE	-END VERTICAL CURVE ELEVATION
EVCS	-END VERTICAL CURVE STATION
EW	-EACH WAY
EWEF	-EACH WAY EACH FACE
EWS	-EYE WASH STATION
EX	-EXISTING
EXIST	-EXISTING
EXT	-EXTERIOR

F

F	-FAHRENHEIT
FA	-FOUL AIR
FAB	-FABRICATE(D)
	-FABRICATION
FAI	-FRESH AIR INTAKE
FC	-FAIL CLOSED
FCA	-FLANGE COUPLING ADAPTER
FCO	-FLOOR CLEAN OUT
FCR	-FINE CRUSHED ROCK
FCV	-FLOW CONTROL VALVE
FD	-FLOOR DRAIN
	-FOUND
FE	-FIRE EXTINGUISHER
	-FLOW ELEMENT
	-FINAL EFFLUENT
FF	-FINISH FLOOR
	-FLAT FACE
FG	-FINISH GATE
FH	-FIRE HYDRANT
FIN	-FINISH
FIT	-FLOW INDICATOR TOTALIZER
FL	-FLANGE
	-FLOORING
	-FLOW LINE
FLC-	-FLOCCULATOR
FLEX	-FLEXIBLE
FLG	-FLANGE(D)
FLR	-FLOOR
FLT	-FILTER
FM	-FORCE MAIN
FMH	-FLEXIBLE METAL HOSE
FMX	-FLASH MIXER
FND	-FOUNDATION
FO	-FAIL OPEN
	-FIBER OPTICS
FPC	-FLEXIBLE PIPE COUPLING
FPS	-FEET PER SECOND
FRP	-FIBERGLASS REINFORCED PLASTIC
FS	-FAR SIDE
	-FLOW SWITCH
FT	-FEET
	-FOOT
FTG	-FOOTING
FUT	-FUTURE

G

GA	-GAGE
	-GAUGE
GAL	-GALLON
GALV	-GALVANIZED
GAS	-NATURAL GAS
GB	-GRADE BREAK
GBV	-GLOBE VALVE
GCO	-GROUND CLEAN OUT
GDR	-GRINDER
GEN	-GENERAL
GFD	-FLUX UNITS
GFI	-GROUND FAULT INTERRUPTER
GI	-GALVANIZED IRON
	-GRAVITY IRRIGATION
GL	-GLASS
	-GLASS LINED
GND	-GROUND
GPD	-GALLONS PER DAY
GPM	-GALLONS PER MINUTE
GRD	-GRADE
GRDR	-GRINDER
GRT	-GROUT
GRTG	-GRATING
GSKT	-GASKET
GSN	-GENERAL STRUCTURAL NOTES
GTS	-GRAVITY THICKENER SUPERNATANT
GV	-GATE VALVE
GYP	-GYPSUM

H

H	-HORIZONTAL
H/A	-HAND AUTO
H/B	-HOSE BIBB
HD	-HEAVY DUTY
HDPE	-HIGH DENSITY POLYETHYLENE
HDR	-HEADER
HEX	-HEXAGONAL
HG	-MERCURY
HH	-HANDHOLE
HM	-HOLLOW METAL
HOA	-HAND-OFF-AUTO
HOR	-HORIZONTAL
HP	-HORSEPOWER
	-HIGH PRESSURE
HR	-HOUR
HRT	-HYDRAULIC RETENTION TIME
HSA	-HEADED STUD ANCHOR
HSS	-HOLLOW STRUCTURAL SECTION
HT	-HEIGHT
HTR	-HEATER
H/V	-HEATING AND VENTILATING
HV	-HAND VALVE
HVAC	-HEATING AND AIR CONDITIONING
HWL	-HIGH WATER LEVEL
HWP	-HOT WATER PUMP
HWR	-HOT WATER RETURN
HWS	-HOT WATER SUPPLY
HYD	-HYDRAULIC
HYDT	-HYDRANT
HZ	-HERTZ (CYCLES PER SECOND)

I

I	-INFLUENT
IC	-INTERMEDIATE CLARIFIER(S)
ICE	-INTERMEDIATE CLARIFIER EFFLUENT
ICI	-INTERMEDIATE CLARIFIER INFLUENT
ICS	-INTERMEDIATE CLARIFIER SLUDGE
ID	-INSIDE DIAMETER
IE	-INVERT ELEVATION
IF	-INSIDE FACE
IN	-INCH
INFO	-INFORMATION
INT	-INTERIOR
	-INTERSECTION
INV	-INVERT
I/O	-INPUT/OUTPUT
IRR	-IRRIGATION
IS	-INERT SOLIDS
ISPWC	-IDAHO STANDARDS FOR PUBLIC WORKS CONSTRUCTION
IT	-INSTRUMENT TAP

J

JB	-JUNCTION BOX
JCT	-JUNCTION
JST	-JOIST
JT	-JOINT
	-JOINT UTILITY TRENCH

K

K	-KIP (1,000 POUNDS)
	-CURVE K VALUE
KV	-KILOVOLT
KVA	-KILOVOLT AMPERE
KW	-KILOWATT
KWH	-KILOWATT HOUR

L

LAM	-LAMINATED
LB	-POUND
LBS/DAY	-POUNDS PER DAY
LEV	-LEVEL
LF	-LINEAL FOOT
LG	-LONG
LH	-LEFT HAND
LIT	-LEVEL INDICATOR TRANSDUCER
LLH	-LONG LEG HORIZONTAL
LLV	-LONG LEG VERTICAL
LP	-LOW PRESSURE
LS	-LIMIT SWITCH
LSH	-LEVEL SWITCH HIGH
LSL	-LEVEL SWITCH LOW
LSLL	-LEVEL SWITCH LOW LOW
LV	-LOW VOLTAGE
LVC	-LENGTH VERTICAL CURVE
LVR	-LOUVER
LWL	-LOW WATER LEVEL
LWR	-LOWER
LLH	-LONG LEG HORIZONTAL
LLV	-LONG LEG VERTICAL

M

M	-METER
	-MALE (PIPE THREAD)
	-MOTOR
MA	-MILLIAMPERE
MAG	-MAGNETIC
MAN	-MANUAL
MAS	-MEMBRANE AIR SCOUR
MAT'L	-MATERIAL
MAX	-MAXIMUM
MBR	-MEMBRANE BIO-REACTOR
	-MEMBER
MCC	-MOTOR CONTROL CENTER
MCU	-MASTER CONTROL UNIT
MD	-MOTORIZED DAMPER
MDS	-MESOPHILIC DIGESTED SLUDGE
ME	-MISCELLANEOUS MECHANICAL EQUIPMENT
MECH	-MECHANICAL
MFR	-MANUFACTURER
MG	-MILLION GALLONS
MGD	-MILLION GALLONS PER DAY
MGL	-MILLIGRAM PER LITER
MGR	-MANAGER
MH	-MANHOLE
MHHW	-MEAN HIGH HIGH WATER
MID	-MIDDLE
MIN	-MINIMUM
	-MINUTE
MISC	-MISCELLANEOUS
MJ	-MECHANICAL JOINT
ML	-MIXED LIQUOR
	-MILLILITER
MLLW	-MEAN LOWER LOW WATER
MLW	-MEAN LOW WATER
MM	-MILLIMETER
MO	-MOTOR OPERATOR
MPH	-MILES PER HOUR
MTR	-MOTOR
MV	-MUD VALVE
	-MILLIVOLT
MX	-MIXER

N

(N)	-NEW
N	-NORTH
NC	-NORMALLY CLOSED
NAOH	-SODIUM HYDROXIDE
NE	-NORTHEAST
NEG	-NEGATIVE
NEMA	-NATIONAL ELECTRICAL MANUFACTURERS
NG	-NATURAL GAS
NIC	-NOT IN CONTRACT
NO	-NORMALLY OPEN
NOM	-NOMINAL
NPS	-NOMINAL PIPE SIZE
NPSH	-NET POSITIVE SUCTION HEAD
NPT	-NATIONAL PIPE THREAD
NTS	-NOT TO SCALE
NTU	-NEPHELOMETRIC TURBIDITY UNITS
NU	-NOT USED
NW	-NORTHWEST

O

OAI	-OUTSIDE AIR INTAKE
OC	-ON CENTER
OD	-OUTSIDE DIAMETER
	-OVERALL DIAMETER
OF	-OVERFLOW
	-OUTSIDE FACE
OFF	-OFFSET
OH	-OVERHEAD
OHP	-OVERHEAD POWER
OL	-OVERLOAD
O/O	-OUT TO OUT
OP	-OVERHEAD POWER
ORP	-OXIDATION REDUCTION POTENTIAL
OSC	-ODOR SCRUBBER

P

P	-PHOSPHOROUS
	-PUMP
PA	-PROCESS AIR
PAR	-PARALLEL
PC	-PIPE COUPLING
	-PRECAST
	-POINT OF CURVATURE
P/C	-PLAIN CONCRETE (NO REINFORCING STEEL)
PCC	-PLANT CONTROL CENTER
PD	-PLANT DRAIN
PDR	-POND DRAIN
PE	-PRIMARY EFFLUENT
	-PLAIN END
	-PLANT EFFLUENT
	-POLYELECTROLYTE
	-POLYMER
PEN	-PENETRATION
PG	-PRESSURE GAUGE
PH	-HYDROGEN ION CONCENTRATION
PI	-PLANT INFLUENT
	-POINT OF INTERSECTION
	-PRESSURE INDICATOR
	-PRESSURE IRRIGATION
PID	-PROPORTIONAL PLUS INTEGRAL PLUS DERIVATIVE CONTROL
PK	-PEAK
P/L	-PROPERTY LINE
PL	-PLATE
PLC	-PROGRAMMABLE LOGIC CONTROLLER
PLE	-PLANT EFFLUENT
PLY	-PLYWOOD
PO4	-PHOSPHATE
PP	-POWER POLE
	-UTILITY POLE
PPD	-POUNDS PER DAY
PPH	-POUNDS PER HOUR
PRE	-PRIMARY EFFLUENT
PRMT	-PERMEATE
PRV	-PRESSURE REGULATING
	-PRESSURE RELIEF
	-PRESSURE REDUCING VALVE
PS	-PRESSURE SWITCH
	-PRESSURE SEWER
PSH	-PRESSURE SENSORS
PSIA	-POUNDS PER SQUARE INCH ABSOLUTE
PSI	-POUNDS PER SQUARE INCH
PSIG	-POUNDS PER SQUARE INCH GAUGE
PT	-POINT OF TANGENCY
	-POINT
PV	-PLUG VALVE
	-PROCESS VARIABLE
PVC	-POLYVINYL CHLORIDE
PVI	-POINT OF VERTICAL INTERSECTION
PVT	-PAVEMENT

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

ABBREVIATIONS

DRAWN: SMC | CHECK: JR

VERIFY SCALE: Scales based on 22"x34" prints.
1-1/2 Inches

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GENERAL ABBREVIATIONS

Q	
QCPL	-QUICK COUPLING
QTY	-QUANTITY
R	
R	-RADIUS
	-RISER
RA	-RETURN AIR
RAS	-RETURN ACTIVATED SLUDGE
RB	-RUBBER WALL BASE
RCP	-REINFORCED CONCRETE PIPE
RCR	-RECORDER
RCY	-RECYCLE
RD	-ROOF DRAIN
	-ROAD
RE:	-REFERENCE
RECP	-RECEPTACLE
RED	-REDUCE(R)
	-REDUCING
REF	-REFERENCE
REG	-REGULATOR
REINF	-REINGORCEMENT(ING)
REL	-RELAY
REQ'D	-REQUIRED
RF	-RAISED FACE
RGS	-RIGID GALVANIZED STEEL
RH	-RIGHT HAND
RI	-RAPID INFILTRATION
RM	-ROOM
RO	-ROUGH OPENING
RPM	-REVOLUTIONS PER MINUTE
RR	-RAILROAD
RS	-RECIRCULATED SLUDGE
RT	-RIGHT
RV	-RELIEF VALVE
R/W	-RIGHT OF WAY
ROW	-RIGHT OF WAY
S	
S	-SOUTH
	-SCUM
	-SINK
	-SECOND
	-SLOPE
SA	-SAMPLE
	-SUPPLY AIR
SB	-SCUM BAFFLE
SBR	-SEQUENCING BATCH REACTOR
SCFM	-STANDARD CUBIC FEET PER MINUTE
SCH	-SCHEDULE
SCM	-SCUM
SCR'D	-SCREWED
SD	-SMOKE DETECTOR
	-STORM DRAIN
SDMH	-STORM DRAIN MANHOLE
SDR	-STORM DRAIN
SE	-SECONDARY EFFLUENT
	-SOUTH EAST
SEC	-SECONDARY CLARIFIER EFFLUENT
SECT	-SECTION
SEP	-SEPARATOR
SF	-SQUARE FOOT
SG	-SUPPLY GRILLE
SHT	-SHEET
SHTH'G	-SHEATHING
SIM	-SIMILAR
SO2	-SULFUR DIOXIDE
SOR	-SURFACE OVERFLOW RATE
SPEC	-SPECIFICATION SECTION
SP	-SPACES
SPC'G	-SPACING
SPL	-SPLICE
SQ	-SQUARE
SRT	-SOLIDS RETENTION TIME
SS	-SANITARY SEWER
	-STAINLESS STEEL
	-SERVICE TANK
	-SUSPENDED SOLIDS
SSMH	-SANITARY SEWER MANHOLE
SST	-STAINLESS STEEL TUBING
ST	-START
	-STREET
STA	-STATION
STD	-STANDARD
STL	-STEEL
STOR	-STORAGE
STRUC	-STRUCTURAL
SV	-SOLENOID VALVE
SVI	-SLUDGE VOLUME INDEX
SW	-SOUTHWEST
	-SOCKETWELD
SYM	-SYMMETRICAL
T	
T	-THERMOSTAT
	-TREAD OF STAIR
	-TANGENT
	-TOP
TB	-TERMINAL BOX
	-TOP AND BOTTOM
TC	-TOP OF CURB
T/D	-TELEPHONE/DATA COMMUNICATIONS
TD	-TIME DELAY RELAY
	-TANK DRAIN
TE	-TERTIARY EFFLUENT
	-TOTALLY ENCLOSED
TEL	-TELEPHONE
TEMP	-TEMPERATURE
	-TEMPORARY
TERM	-TERMINATE
THD'D	-THREADED
THRU	-THROUGH
T&G	-TONGUE AND GROOVE
TK	-TANK
TKN	-TOTAL KJELDAHL NITROGEN
TOC	-TOP OF CONCRETE
TOF	-TOP OF FOOTING
TOG	-TOP OF GROUT
TOP	-TOP OF PIPE
TOM	-TOP OF MASONRY
TOW	-TOP OF WALL
TP	-TOTAL PHOSPHORUS
TPD	-TONS PER DAY
TR	-TIMING RELAY
TRANS	-TRANSMITTANCE
	-TRANSFORMER
TRM	-TRANSMITTER
TRN	-TRANSDUCER
TS	-TEMPERATURE SWITCH
	-TUBE STEEL
TSS	-TOTAL SUSPENDED SOLIDS
TV	-TELEVISION
TYP	-TYPICAL
U	
UG	-UNDERGROUND
UGP	-UNDERGROUND POWER
UH	-UNIT HEATER
UL	-UNDERWRITERS LABORATORIES
	-ULTIMATE LOAD
UN	-UNION
UNO	-UNLESS NOTED OTHERWISE
U/P	-UTILITY POLE
UPS	-UNINTERRUPTIBLE POWER SUPPLY
UV	-ULTRA VIOLET
UW	-UTILITY WATER (NONPOTABLE)
V	
V	-VALVE
	-VENT
	-VOLTS
	-VAULT
VAC	-VACUUM
	-VOLTS ALTERNATING CURRENT
VAR	-VARIABLE
VB	-VALVE BOX
VCP	-VITRIFIED CLAY PIPE
VCT	-VINYL COMPOSITE TILE
VDC	-VOLTS DIRECT CURRENT
VERT	-VERTICAL
VOL	-VOLUME
VSS	-VOLATILE SUSPENDED SOLIDS
VTC	-VENT TO CEILING
VTR	-VENT THRU ROOF
W	
W	-POTABLE WATER
	-WEST
W/	-WITH
WAS	-WASTE ACTIVATED SLUDGE
WC	-WATER COLUMN
WCO	-WALL CLEAN OUT
WEG	-WALL EXHAUST GRILLE
WER	-WALL EXHAUST REGISTER
WF	-WIDE FLANGE
WG	-WASTE GAS
W/O	-WITHOUT
WOG	-WATER/OIL/GAS WORKING PRESSURE
WPR	-WASHER COMPACTOR
WS	-WATER SURFACE
WSA	-WELDED STUD ANCHOR
WSP	-WELDED STEEL PIPE
WSTP	-WATERSTOP
WT	-WEIGHT
WWF	-WELDED WIRE FABRIC
WWP	-WATER WORKING PRESSURE
X	
XFMR	-POWER TRANSFORMER
XLP	-CROSS LINKED POLYETHYLENE
XP	-EXPLOSION PROOF
Y	
YCO	-YARD CLEANOUT
YD	-YARD
	-YARD DRAIN
YR	-YEAR
Z	
ZS	-POSITION SWITCH

#	-NUMBER
	-POUNDS
&	-AND
@	-AT
Ø	-DIAMETER
	-PHASE
Δ	-ANGLE OF DEFLECTION

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

ABBREVIATIONS CONT.

DRAWN: DAC | CHECK: JR

VERIFY SCALE: Scales based on 22"x34" prints.
1-1/2 Inches

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PROJECT RESPONSIBILITY MATRIX

Site	Tag #	Equipment Description	Manufacturer	Model Number	Furnished By	Installed By	Wiring and Pathway By
BEACH	ATS-A100	AUTOMATIC TRANSFER SWITCH	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	GEN-A100	GENERATOR	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LVP-A100	LOW VOLTAGE PANEL	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LCP-A100	LOCAL CONTROL PANEL			INTEGRATOR	CONTRACTOR	CONTRACTOR
BEACH	MCP-A100	MOTOR CONTROL PANEL			INTEGRATOR	CONTRACTOR	CONTRACTOR
BEACH	PMP-A100	SUBMERSIBLE PUMP	PER SPEC, DIV 43	PER SPEC, DIV 43	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	RVNR-A100	PMP-A100 MOTOR ACROSS THE LINE STARTER			INTEGRATOR	CONTRACTOR	CONTRACTOR
BEACH	MSH-A100	PMP-A100 MOISTURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
BEACH	TSH-A100	PMP-A100 TEMPERATURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
BEACH	PMP-A110	SUBMERSIBLE PUMP	PER SPEC, DIV 43	PER SPEC, DIV 43	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	RVNR-A110	PMP-A110 MOTOR ACROSS THE LINE STARTER			INTEGRATOR	CONTRACTOR	CONTRACTOR
BEACH	MSH-A110	PMP-A110 MOISTURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
BEACH	TSH-A110	PMP-A110 TEMPERATURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
BEACH	LT-A100	RADAR LEVEL TRANSMITTER	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LSH-A100	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LS-A101	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LS-A102	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LS-A103	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	LSL-A100	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	PI-A100	LIQUID FILLED PRESSURE GAUGE	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	PI-A110	LIQUID FILLED PRESSURE GAUGE	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH	FE-A100	MAGNETIC FLOW METER	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
BEACH		AUTODIALER			INTEGRATOR	CONTRACTOR	CONTRACTOR
SUPERIOR	ATS-B100	AUTOMATIC TRANSFER SWITCH	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	GEN-B100	GENERATOR	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LVP-B100	LOW VOLTAGE PANEL	PER SPEC, DIV 26	PER SPEC, DIV 26	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LCP-B100	LOCAL CONTROL PANEL			INTEGRATOR	CONTRACTOR	CONTRACTOR
SUPERIOR	MCP-B100	MOTOR CONTROL PANEL			INTEGRATOR	CONTRACTOR	CONTRACTOR
SUPERIOR	PMP-B100	SUBMERSIBLE PUMP	PER SPEC, DIV 43	PER SPEC, DIV 43	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	RVNR-B100	PMP-B100 MOTOR ACROSS THE LINE STARTER			INTEGRATOR	CONTRACTOR	CONTRACTOR
SUPERIOR	MSH-B100	PMP-B100 MOISTURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
SUPERIOR	TSH-B100	PMP-B100 TEMPERATURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
SUPERIOR	PMP-B110	SUBMERSIBLE PUMP	PER SPEC, DIV 43	PER SPEC, DIV 43	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	RVNR-B110	PMP-B110 MOTOR ACROSS THE LINE STARTER			INTEGRATOR	CONTRACTOR	CONTRACTOR
SUPERIOR	MSH-B110	PMP-B110 MOISTURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
SUPERIOR	TSH-B110	PMP-B110 TEMPERATURE SWITCH			WITH PUMP	MANUFACTURER	CONTRACTOR
SUPERIOR	LT-B100	RADAR LEVEL TRANSMITTER	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LSH-B100	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LS-B101	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LS-B102	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LS-B103	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	LSL-B100	FLOAT LEVEL SWITCH	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	PI-B100	LIQUID FILLED PRESSURE GAUGE	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	PI-B110	LIQUID FILLED PRESSURE GAUGE	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR	FE-B100	MAGNETIC FLOW METER	PER SPEC, DIV 40	PER SPEC, DIV 40	CONTRACTOR	CONTRACTOR	CONTRACTOR
SUPERIOR		AUTODIALER			INTEGRATOR	CONTRACTOR	CONTRACTOR

GENERAL SHEET NOTES

1. THE TABLE IS NOT ALL INCLUSIVE AND IS INTENDED TO PROVIDE CLARIFICATION ON THE RESPONSIBILITY OF THE CONTRACTOR TO FURNISH AND INSTALL EQUIPMENT. THIS LIST MAY NOT INCLUDE ALL ITEMS NECESSARY TO COMPLETE THIS PROJECT. ITEMS NOT DOCUMENTED IN THIS TABLE WILL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH AND INSTALL AS REQUIRED. CONTRACTOR IS ULTIMATELY RESPONSIBLE TO FURNISH AND INSTALL EQUIPMENT AS NECESSARY FOR A FULLY FUNCTIONAL WELL FACILITY.
2. CONTRACTOR TO VERIFY EQUIPMENT NOTED AS PROVIDED BY INTEGRATOR PRIOR TO CONSTRUCTION.
3. CONTRACTOR TO PICK UP INTEGRATOR PROVIDED EQUIPMENT FROM OWNER LOCATION.
4. INTEGRATOR HAS CONTRACTED SEPARATELY WITH CONTROLS INTEGRATOR. ALL INTEGRATION OF EQUIPMENT AND CONTROLS SYSTEMS WITH CITY OF SANDPOINT SCADA SYSTEM TO BE PROVIDED UNDER SEPARATE CONTRACT. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH OWNER INTEGRATOR IN ORDER TO PROVIDE A COMPLETE AND FULLY FUNCTIONING SYSTEM.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

EQUIPMENT RESPONSIBILITY MATRIX

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EXISTING TOPOGRAPHY

- 2460 — TOPOGRAPHIC CONTOUR
- EG — EDGE OF GRAVEL
- EP — EDGE OF PAVEMENT
- CURB & GUTTER, SIDEWALK & DROP INLET
- GENERIC GATE / SWING GATE — FENCE (BARBED WIRE OR OTHER WITH GATES)
- SLIDER GATE — FENCE (CHAINLINK WITH GATE)
- DITCH FLOWLINE
- TP-31 — TEST PIT
- SIGN
- BUILDING OR STRUCTURE

PROPERTY & CONTROL

- CP #203 — SURVEY CONTROL POINT
- BM-#1 — BENCHMARK
- FOUND BRASS CAP
- FOUND ALUMINUM CAP
- FOUND 5/8" STEEL PIN
- SET 5/8" STEEL PIN W/CAP
- FOUND 1/2" STEEL PIN
- SET 1/2" STEEL PIN W/CAP
- FOUND PK NAIL
- SET PK NAIL
- CALCULATED POINT
- WC — WITNESS CORNER
- EASEMENT - UTILITY
- EASEMENT - TEMPORARY
- EASEMENT - SETBACK
- PROJECT BOUNDARY
- P/L — PROPERTY LINES
- SECTION LINES
- R/W — PRESCRIPTIVE RIGHT OF WAY
- ROW — DEDICATED RIGHT OF WAY
- ( ) — DATA OF RECORD
- 6 / 7 — QUARTER SECTION - NOT FOUND
- 5 — CENTER SECTION
- 5 / 6 / 7 / 8 — SECTION CORNER - FOUND

EXISTING UTILITY

- 8"W — WATERLINE & VALVE
- 12"SS> — SANITARY SEWER LINE & MANHOLE
- <4"SS — SANITARY SEWER SERVICE & CLEANOUT
- PS — PRESSURE SEWER LINE & VALVE VAULT
- 10"SD> — STORM DRAIN LINE & MANHOLE
- 8"PI — PRESSURE IRRIGATION & VALVE
- GI — GRAVITY IRRIGATION & MANHOLE
- PP — OHP — OVERHEAD POWER LINE & POWER POLE
- UGP — UNDERGROUND POWER LINE
- SIGNAL POLE
- LIGHT POLE
- NG — NATURAL GAS LINE
- FO — FIBER OPTIC LINE
- TR — T — TELEPHONE LINE & RISER
- TV — CABLE — CABLE LINE & RISER

PROPOSED GRADING

- 2457 — TOPOGRAPHIC CONTOUR
- RIDGELINE
- 1.50% — DRAINAGE ARROW & SLOPE
- 57.73 — SPOT ELEVATION
- SWALE FLOWLINE
- DAYLIGHT - CUT LINE
- DAYLIGHT - FILL LINE

PROPOSED DEMOLITION, ABANDONMENT, REMOVAL

- DEMOLITION & REMOVAL
- ABANDON IN PLACE
- REMOVE SURFACE FEATURE
- CLEARING AND GRUBBING

PROPOSED SITE

PROPOSED SITE (CONT.)

- GENERIC GATE / SWING GATE — FENCE (BARBED WIRE OR OTHER WITH GATES)
- SLIDER GATE — FENCE (CHAINLINK WITH GATE)
- EP — EDGE OF PAVEMENT
- EG — EDGE OF GRAVEL
- SIGN
- 6" VERTICAL CURB, GUTTER, SIDEWALK & INLET
- 6" VERTICAL CUT CURB & GUTTER
- 6" REVERSE CURB & GUTTER
- 6" REVERSE CUT CURB & GUTTER
- IMBEDDED CURB

PROPOSED UTILITY

FLANGED / MECHANICAL JOINT — FITTING TYPES

- 45° — 8"W — BEND
- 8"W — 8"W — REDUCING TEE
- TEE
- REDUCER
- FLANGE TO MECHANICAL JOINT COUPLING
- CROSS
- CAP W/BLIND FLANGE
- CHECK VALVE
- GATE VALVE
- BUTTERFLY VALVE
- BLOW-OFF VALVE
- RESTRAINED FITTING
- WM — WATER SERVICE LINE & METER
- FIRE HYDRANT
- 8" FIRE — 8" FIRE — FIRE LINE
- 8"W — 8"W — WATERLINE
- MW — MONITORING WELL
- LOCATION WIRE BOX
- NON-FREEZE YARD HYDRANT
- 8"PI — PRESSURE IRRIGATION, TEE & GATE VALVE
- 2"PI — PRESSURE IRRIGATION SERVICE
- 8"GI< — 8"GI< — GRAVITY IRRIGATION & STRUCTURE

PROPOSED UTILITY (CONT.)

- 8"SS< — 8"SS< — SANITARY SEWER & MANHOLE
- 4"SS< — SANITARY SEWER SERVICE & CAP
- 4"SS< — 4"SS< — SANITARY SEWER SERVICE & CLEANOUT
- 8"PS< — 8"PS< — PRESSURE SEWER & VALVE VAULT
- 18"SD< — 15"SD< — STORM DRAIN LINE, INLET & CATCH BASIN
- 12"SD< — 12"SD< — STORM DRAIN LINE & MANHOLE W/ VENTED LID
- JT — JOINT TRENCH IN PROFILE
- CABLE & TELEPHONE RISERS
- JT — DEVICE — JT — JOINT TRENCH & DEVICE
- JUNCTION BOX & DUCT BANK
- NG — GM — NG — NATURAL GAS LINE & METER
- NG — GR — NG — NATURAL GAS LINE & RISER
- NG — NG — NATURAL GAS LINE & VALVE
- UGP — UGP — UNDERGROUND POWER
- OHP — PP — OHP — OVERHEAD POWER & POLE
- LIGHT POLE
- T — T — TR — TELEPHONE LINE & RISER
- T — FO — FO — FIBER OPTIC LINE & VAULT
- T/D — T/D — TELEPHONE DATA LINE
- TV — CABLE — CABLE & TV RISER

DETAIL & SECTION CALLOUT KEY

DISCIPLINE DETAIL DESIGNATORS

C CIVIL (C-500 SHEETS)	H HVAC (MH-500 SHEETS)
A ARCHITECTURAL (A-500 SHEETS)	M MECHANICAL (M-500 SHEETS)
S STRUCTURAL (S-500 SHEETS	E ELECTRICAL (E-500 SHEETS)
U PLUMBING (MP-500 SHEETS)	EI INSTRUMENTATION (EI-500 SHEETS)

(REFERENCE)
RE: A1/S-101-A — (SECTION OR DETAIL NO./SHEET NO.)
RE: C1201 — (DISCIPLINE DETAIL NO. SEE RESPECTIVE 500 SHEETS)

C2 — (SECTION OR DETAIL NO.) — A1
S-301-B — (SHEET NO.) — C-204
M303 — (DISCIPLINE DETAIL NO. SEE RESPECTIVE 500 SHEETS)

(SECTION OR DETAIL NO./GRID LOCATION)
A1 — TYPICAL SECTION — (DETAIL TITLE)
SCALE: 1"=1" (0 1 2)

(DISCIPLINE DETAIL NO. SEE RESPECTIVE 500 SHEETS)
S2135 — PROJECT DETAIL — (DETAIL TITLE)
N.T.S.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER — LICENSED — Kyle Meschke — 17127 — REGISTERED ENGINEER — 8/6/2024 — STATE OF IDAHO — KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

CIVIL SYMBOLS & LINE LEGEND

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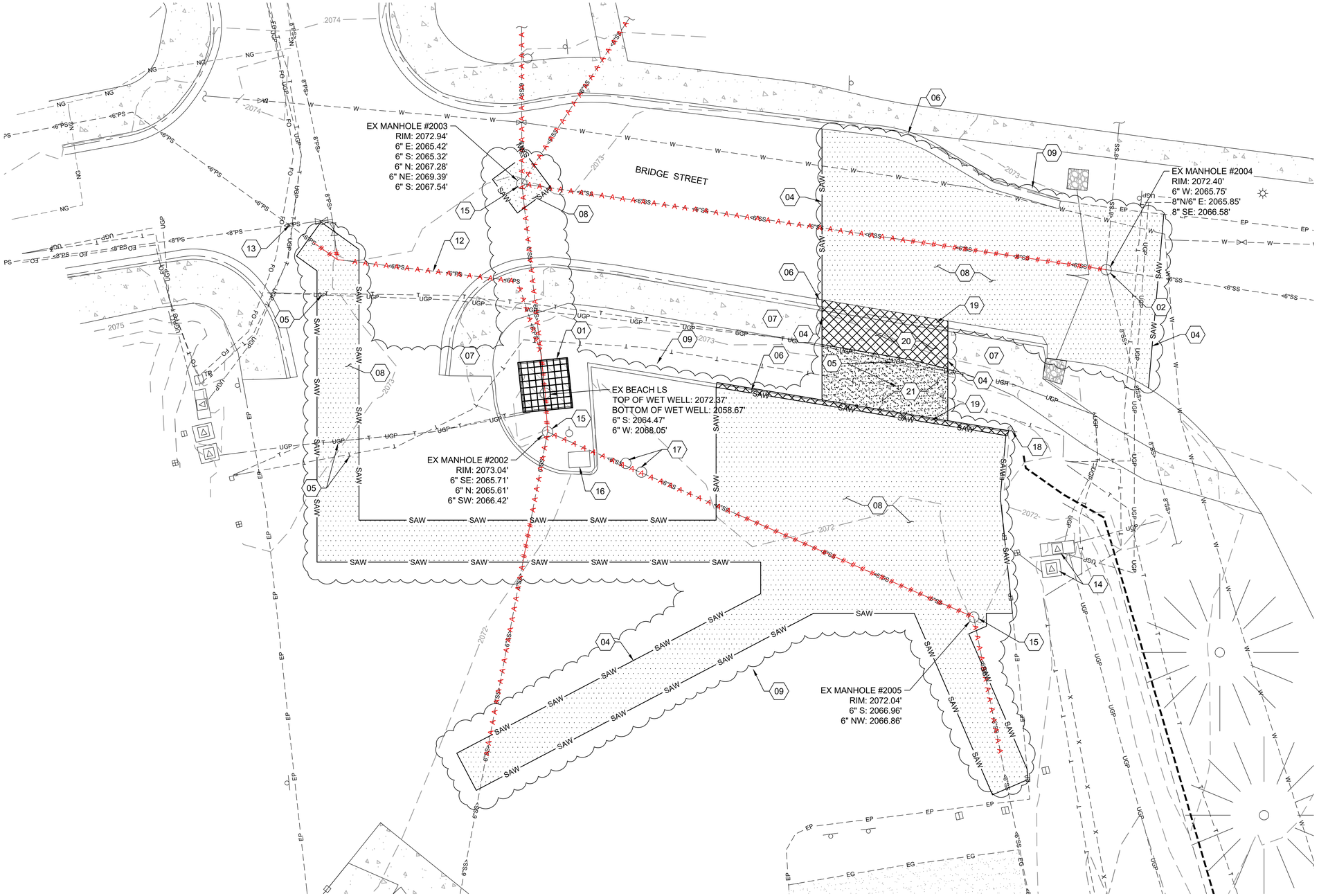
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PROJECT NO. 223072 | PAGE

SHEET NO. C-001

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GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. CONTRACTOR TO DISPOSE OF DEMOLISHED STRUCTURES, EQUIPMENT AND OTHER MATERIALS OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS AND THE PROJECT SPECIFICATIONS UNLESS NOTED OTHERWISE. IN GENERAL MATERIALS REMOVED FROM THE EXISTING FACILITY WILL NOT BE SALVAGED, HOWEVER CONTRACTOR TO COORDINATE WITH OWNER DURING DEMOLITION TO VERIFY.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REMOVE TREES, SHRUBS, AND VEGETATION WITHIN THE EXTENTS OF CONSTRUCTION AS REQUIRED AND DISPOSE OF MATERIAL OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS UNLESS NOTED OTHERWISE.
5. CONTRACTOR TO COORDINATE DEMOLITION WITH ENGINEER AND OWNER TO ENSURE SEWER SERVICE IS NOT DISRUPTED.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

SHEET KEYNOTES

01 DEMOLISH LIFT STATION PUMPS, MECHANICAL EQUIPMENT, STRUCTURE, AND CONCRETE SLAB. ABANDON WET WELL; RE: STD DTL C8000; REFER TO WORK SEQUENCE DESCRIBED IN 01 35 13
02 DEMOLISH EXISTING MANHOLE
04 SAWCUT SIDEWALK AT NEAREST JOINT AND LEAVE CLEAN VERTICAL EDGE FOR REPAIRS,
05 RETAIN & PROTECT; CONTRACTOR TO POTHOLE AND FIELD VERIFY LOCATION OF UNDERGROUND UTILITIES
06 RETAIN & PROTECT EXISTING CURB
07 RETAIN & PROTECT EXISTING SIDEWALK
08 DEMOLISH EXISTING ASPHALT
09 DEMOLITION LIMITS/LIMITS OF CONSTRUCTION. ALL WORK AND ON-SITE STORAGE TO BE CONTAINED WITHIN THIS AREA
12 ABANDON EXISTING FORCEMAIN (LENGTH MAY VARY)
13 CONTRACTOR TO CUT AND FIT PRESSURE SEWER PIPES
14 RETAIN AND PROTECT ELECTRICAL EQUIPMENT
15 ABANDON MANHOLE; RE: STD DTL C8000
16 REMOVE EXISTING VAULT
17 RETAIN AND PROTECT EXISTING WATER MANHOLES
18 DEMOLISH SIGN, SALVAGE TO CITY
19 DEMOLISH EXISTING CURB
20 DEMOLISH EXISTING SIDEWALK
21 REMOVE MISCELLANEOUS SURFACE

DEMO LEGEND

- REMOVE STRUCTURE
- REMOVE ASPHALT
- REMOVE CONCRETE
- REMOVE MISC SURFACE
- ABANDON PIPE
- REMOVE PIPE
- EXTENT OF DEMOLITION/LIMITS OF CONSTRUCTION

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER
LICENSED
Kyle Meschko
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION
DEMOLITION PLAN

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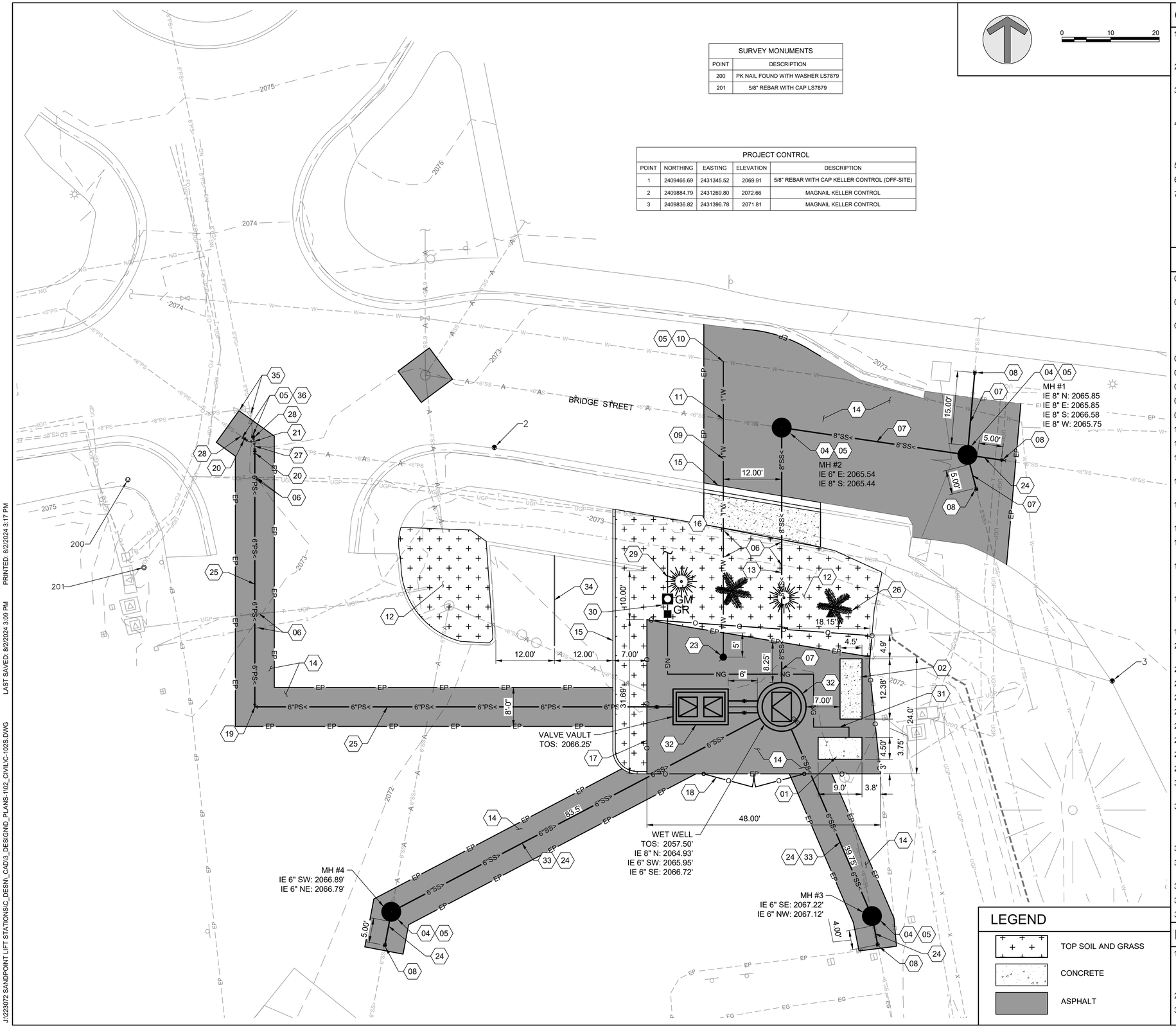
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SURVEY MONUMENTS	
POINT	DESCRIPTION
200	PK NAIL FOUND WITH WASHER LS7879
201	5/8" REBAR WITH CAP LS7879

PROJECT CONTROL				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	2409466.69	2431345.52	2069.91	5/8" REBAR WITH CAP KELLER CONTROL (OFF-SITE)
2	2409884.79	2431269.80	2072.66	MAGNAIL KELLER CONTROL
3	2409836.82	2431396.78	2071.81	MAGNAIL KELLER CONTROL



GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. FURNISH MATERIALS WHERE "INSTALL", "PLACE" OR "CONSTRUCT" IS REQUIRED UNLESS NOTED OTHERWISE.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REMOVE TREES, SHRUBS, AND VEGETATION WITHIN THE EXTENTS OF CONSTRUCTION AS REQUIRED AND DISPOSE OF MATERIAL OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS UNLESS NOTED OTHERWISE.
5. ALL BURIED METAL PIPE TO BE INSTALLED IN PE WRAP; RE: SPEC.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

SHEET KEYNOTES

01 INSTALL 36-INCH THICK CONCRETE GENERATOR PAD; RE: ELECTRICAL & STD DTL C1421. EXCAVATION PER C1/C-503.

02 INSTALL 36-INCH THICK CONCRETE PAD FOR CONTROL PANEL, RE: ELECTRICAL & C1421. EXCAVATION PER C1/C-503.

04 INSTALL 48" MANHOLE, CONTRACTOR TO POTHOLE AND VERIFY EXISTING INVERTS, SIZES, AND ANGLES PRIOR TO PURCHASING MANHOLES; RE: STD DTL C6003. EXCAVATION PER C1/C-503.

05 CONTRACTOR TO POTHOLE AND FIELD VERIFY CONNECTION LOCATION

06 RETAIN & PROTECT EXISTING UTILITY

07 INSTALL PIPE - 8" SS (12.A), RE: STD DTL C3011

08 CONNECT TO EXISTING PIPE WITH MAXADAPTOR, MATCH PIPE SIZE

09 INSTALL PIPE - 1" W (20.C), RE: STD DTL C3011

10 INSTALL SERVICE LINE; CONNECT TO EXISTING; RE: A4/C-502

11 POTABLE/NON-POTABLE CROSSING; RE: STD DTL C3001

12 CONSTRUCT MISCELLANEOUS SURFACE REPAIR - TOP SOIL (MIN 3-INCH DEPTH) AND GRASS SEED PER ISPWC

13 GRAVITY SEWER PIPE; CONNECT TO EXISTING LINE AT MINIMUM SLOPE 0.4% OR GREATER

14 CONSTRUCT TYPE P SURFACE RESTORATION; RE: ISPWC SD-303 & STD DTL C3032

15 INSTALL CURB, MATCH EXISTING; RE: STD DTL C1201

16 INSTALL SIDEWALK, MATCH EXISTING; RE: STD DTL C1401. SIDEWALK TO BE ADA COMPLIANT

17 INSTALL FENCED ENCLOSURE. BASE BID: CHAINLINK FENCE; RE: STD DTL C0221 AND SPEC 32 31 13. ADDITIVE ALTERNATE BID: WELDED STEEL ORNAMENTAL FENCE; RE: SPEC 32 31 14

18 INSTALL 20-FT DOUBLE SWING GATE. BASE BID: CHAINLINK GATE; RE: STD DTL C0323 AND SPEC 32 31 13. ADDITIVE ALTERNATE BID: WELDED STEEL ORNAMENTAL GATE; RE: SPEC 32 31 14

19 INSTALL FITTING - 6" 90° BEND

20 INSTALL VALVE - 6" PLUG VALVE, RE: STD DTL C7001. PROVIDE FITTINGS AS REQUIRED

21 INSTALL FITTING - 6" TEE

23 INSTALL YARD HYDRANT ASSEMBLY; RE: STD DTL C7045

24 INSTALL PIPE - 6" SS (12.A), RE: STD DTL C3011

25 INSTALL PIPE - 6" PS (13.D), RE: STD DTL C3011

26 VEGETATIVE BARRIER TO BE PROVIDED BY OWNER

27 INSTALL FITTING - 11.25° BEND

28 CONNECT TO EXISTING PIPE WITH ROMAC ALPHA COUPLER

29 NATURAL GAS PIPING BY AVISTA UTILITIES

30 NATURAL GAS METER AND REGULATOR BY AVISTA. VERIFY LOCATION WITH AVISTA.

31 INSTALL PIPE TO GENERATOR CONNECTION IN ACCORDANCE WITH AVISTA REQUIREMENTS AND RECOMMENDATIONS; PROVIDE WITH SHUTOFF VALVE, PRESSURE REGULATOR, AND FLEX CONNECTION. VERIFY POINT OF CONNECTION WITH GENERATOR VENDOR.

32 EXCAVATION PER STD C1/C-503.

33 GRAVITY SEWER PIPE; CONNECT TO EXISTING LINE AT MINIMUM SLOPE 0.6% OR GREATER

34 4-INCH WHITE PARKING STALL STRIPING

35 RETAIN AND PROTECT EXISTING ISOLATION VALVE

36 RETAIN AND PROTECT EXISTING 6" PS

LEGEND

- TOP SOIL AND GRASS
- CONCRETE
- ASPHALT

NATURAL GAS SHEET NOTES

1. NG PIPING BY AVISTA UTILITIES FROM EXISTING NATURAL GAS LINE TO NATURAL GAS METER ASSEMBLY. RETAIN AND PROTECT EXISTING NG PIPING DURING CONSTRUCTION. CONTRACTOR TO INSTALL PIPE DOWNSTREAM OF METER ASSEMBLY.
2. NATURAL GAS LINE TO HAVE MINIMUM 3 FEET OF COVER.
3. CONTRACTOR TO COORDINATE GAS LINE CONSTRUCTION WITH GAS COMPANY, AND CITY, AS NECESSARY

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER
LICENSED
Kyle Meschko
EXPIRES: 12/31/2025
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION
SITE & UTILITY PLAN

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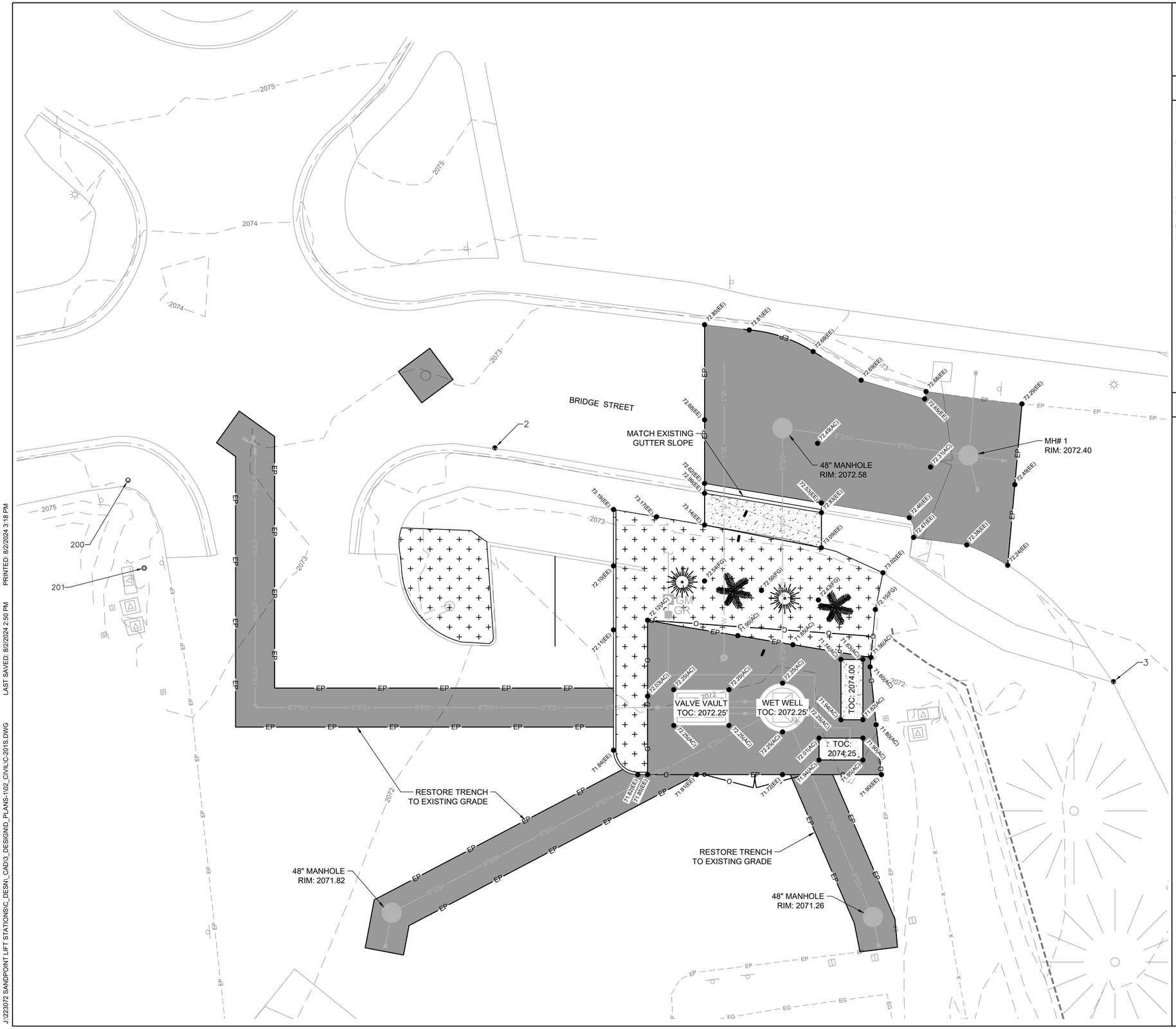
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GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. FURNISH MATERIALS WHERE "INSTALL", "PLACE" OR "CONSTRUCT" IS REQUIRED UNLESS NOTED OTHERWISE.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REFER TO SHEET C-102-A FOR SITE CONTROL & MONUMENTS.
5. ALL BURIED METAL PIPE TO BE INSTALLED IN PE WRAP; RE: SPEC.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

ABBREVIATIONS

AC	Top of Asphalt
TOC	Top of Concrete
EE	Existing Elevation
FF	Finished Floor
FG	Finished Grade
FL	Flow Line
FOW	Face of Sidewalk
GVL	Top of Gravel
RIM	Rim of Manhole, Inlet or Catch Basin
TBC	Top Back of Curb
TSW	Top of Sidewalk

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER
LICENSED
Kyle Meschko
EXPIRES: 12/31/2025
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION
GRADING & DRAINAGE PLAN

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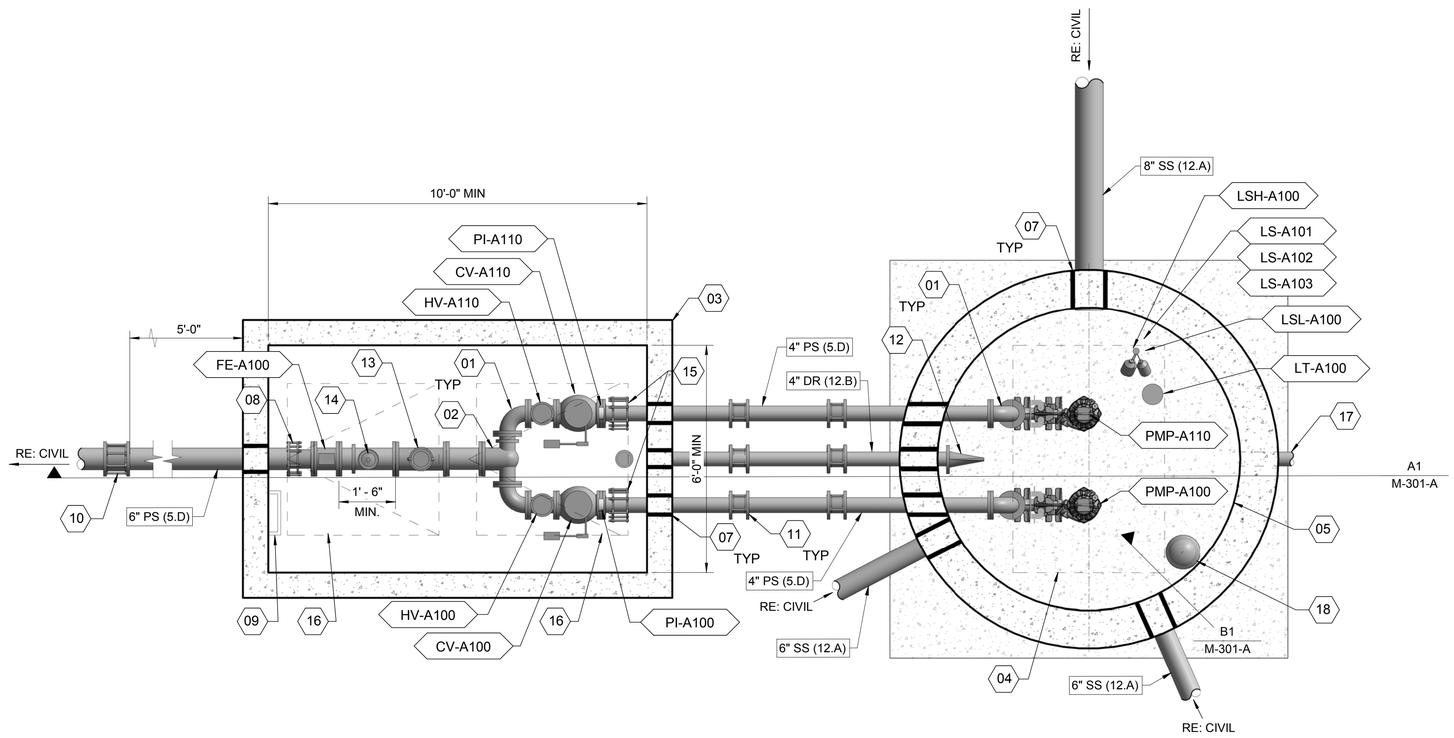
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A1 MECHANICAL PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. WORK SHALL BE SEQUENCED TO KEEP THE EXISTING LIFT STATION IN OPERATION. COORDINATE WORK IN ACCORDANCE WITH SPECIFICATION SECTION 01 35 13.
2. REFERENCE STANDARD MECHANICAL NOTES, SHEET M-001, FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL SUPPORT PIPING AND VALVES IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 07 AND STD DTLS, RE: M-500 SERIES SHEETS.
4. CONTRACTOR SHALL INSTALL EQUIPMENT AS PER MANUFACTURER'S INSTRUCTIONS.
5. PIPING, VALVES, AND EQUIPMENT SHALL BE COATED IN ACCORDANCE WITH SPECIFICATION SECTION 09 90 00.
6. REFERENCE PIPE SCHEDULE, SHEET G-003, FOR PIPING MATERIALS AND TEST PRESSURES.
7. ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT AND RESTRAINED WITH RETAINER GLANDS OR THRUST BLOCKS AS PER THE SPECIFICATIONS AND DRAWINGS. SEE STD DTL C7204 FOR THRUST BLOCK INSTALLATION.
8. VALVES AND FITTINGS SHALL MATCH PIPE SIZE, TYPE, AND LININGS.
9. ALL HARDWARE, SUPPORTS, AND ANCHORS SHALL BE STAINLESS STEEL IN WET WELL AND VALVE VAULT.
10. CONCRETE FILLET SHALL NOT INTERFERE WITH FLOAT OPERATION. INFLUENT DISCHARGE SHALL NOT CAUSE FLOATS TO SWING. LOCATE AS DIRECTED BY EQUIPMENT SUPPLIER.
11. WET WELL SHALL BE TESTED FOR HYDRAULIC LEAKS PRIOR TO PLACING INTO OPERATION, RE: SPECIFICATIONS.
12. ALL BURIED DUCTILE IRON PIPE TO BE INSTALLED IN PE WRAP; RE: SPECS

SHEET KEYNOTES

01	4" 90° ELBOW
02	6" x 4" TEE
03	PRECAST CONCRETE UTILITY VAULT, RE: SPEC
04	HS-20 RATED 4' x 6' ALUMINUM ACCESS HATCH WITH FALL PROTECTION, RE: SPEC & STD DTL M250
05	8'-0" INSIDE DIAMETER PRECAST WET WELL AND BASE. CONTRACTOR TO VERIFY INVERT LOCATIONS AND ELEVATIONS PRIOR TO PURCHASING.
06	PIPE SUPPORT, RE: STD DTL M018
07	PIPE PENETRATION, RE: STD DTL M253
08	6" DISMANTLING JOINT
09	MANHOLE STEPS, RE: C6028
10	6" FLEXIBLE COUPLING
11	4" FLEXIBLE COUPLING
12	4" DUCK BILL CHECK VALVE, RE: SPEC
13	6" x 3" TEE TO BYPASS ASSEMBLY
14	2" COMBINATION AIR VALVE, RE: SPEC & STD DTL M140. PIPE TO DRAIN.
15	4" DISMANTLING JOINT
16	HS-20 RATED 4' x 4' ALUMINUM ACCESS HATCH, RE: SPEC & STD DTL M239
17	ELECTRICAL CONDUIT, RE: E-101-A
18	WAGER 1800 ODOR CONTROL UNIT WITH RAIN SHIELD; FITTINGS AS NECESSSARY. PROVIDE SUBMITTAL PRIOR TO ORDERING.

EQUIPMENT KEYNOTES

CV-A100	4" CHECK VALVE, RE: SPEC
CV-A110	4" CHECK VALVE, RE: SPEC
FE-A100	6" FLOW METER, RE: SPEC
HV-A100	4" PLUG VALVE, RE: SPEC
HV-A110	4" PLUG VALVE, RE: SPEC
LS-A101	LEVEL FLOAT, RE: STD DTL M297
LS-A102	LEVEL FLOAT, RE: STD DTL M297
LS-A103	LEVEL FLOAT, RE: STD DTL M297
LSH-A100	LEVEL FLOAT, RE: STD DTL M297
LSL-A100	LEVEL FLOAT, RE: STD DTL M297
LT-A100	LEVEL TRANSMITTER, RE: STD DTL M901
PI-A100	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PI-A110	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PMP-A100	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00
PMP-A110	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00

KELLER ASSOCIATES
601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSE
Kyle Meschko
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - MECHANICAL PLAN

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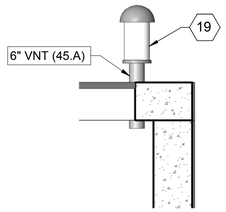
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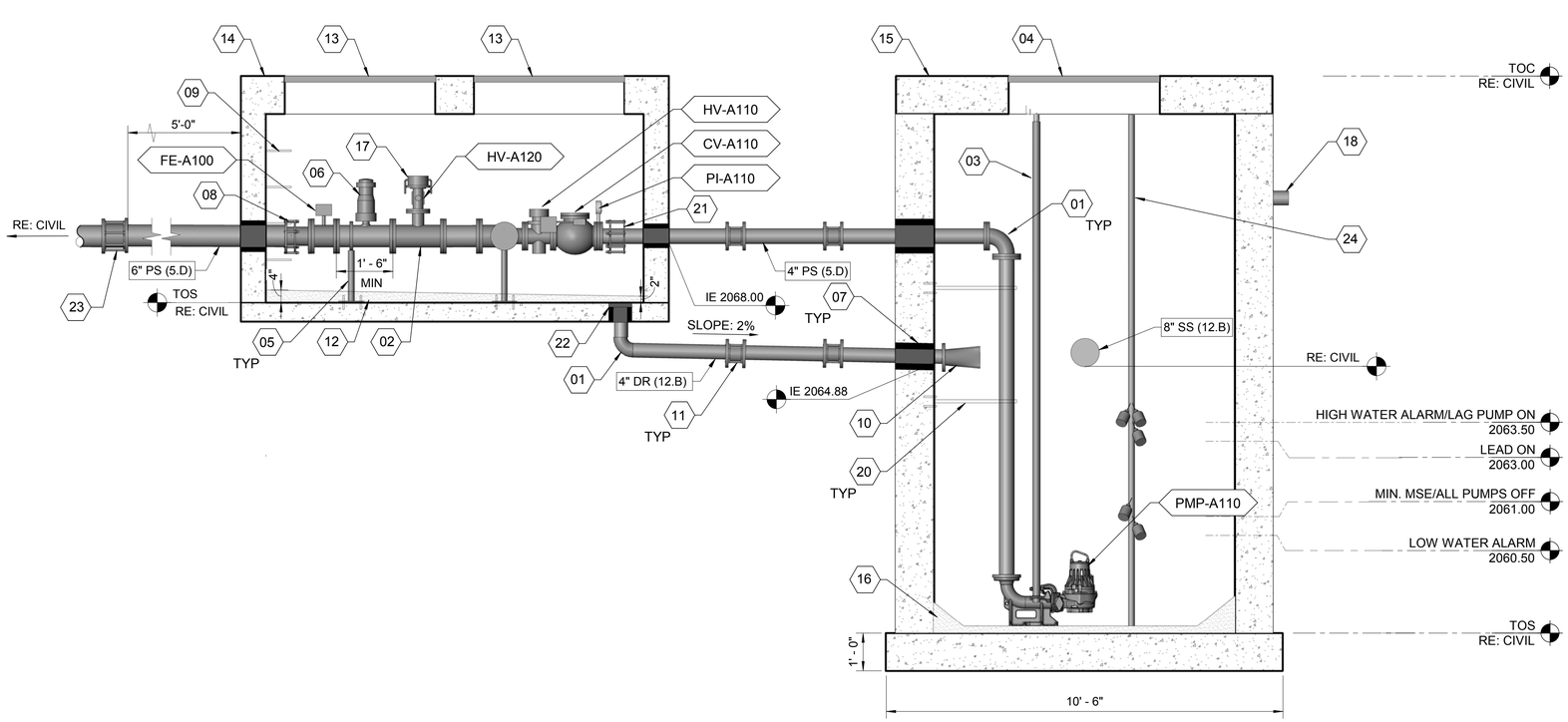
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B1 VENT SECTION

1/2" = 1'-0"

1/2" 0 1' 2' 4'



A1 MECHANICAL SECTION

1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. WORK SHALL BE SEQUENCED TO KEEP THE EXISTING LIFT STATION IN OPERATION. COORDINATE WORK IN ACCORDANCE WITH SPECIFICATION SECTION 01 35 13.
2. REFERENCE STANDARD MECHANICAL NOTES, SHEET M-001, FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL SUPPORT PIPING AND VALVES IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 07 AND STD DTLS, RE: M-500 SERIES SHEETS.
4. CONTRACTOR SHALL INSTALL EQUIPMENT AS PER MANUFACTURER'S INSTRUCTIONS.
5. PIPING, VALVES, AND EQUIPMENT SHALL BE COATED IN ACCORDANCE WITH SPECIFICATION SECTION 09 90 00.
6. REFERENCE PIPE SCHEDULE, SHEET G-003, FOR PIPING MATERIALS AND TEST PRESSURES.
7. ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT AND RESTRAINED WITH RETAINER GLANDS OR THRUST BLOCKS AS PER THE SPECIFICATIONS AND DRAWINGS. SEE STD DTL C7204 FOR THRUST BLOCK INSTALLATION.
8. VALVES AND FITTINGS SHALL MATCH PIPE SIZE, TYPE, AND LININGS.
9. ALL HARDWARE, SUPPORTS, AND ANCHORS SHALL BE STAINLESS STEEL IN WET WELL AND VALVE VAULT.
10. CONCRETE FILLET SHALL NOT INTERFERE WITH FLOAT OPERATION. INFLUENT DISCHARGE SHALL NOT CAUSE FLOATS TO SWING. LOCATE AS DIRECTED BY EQUIPMENT SUPPLIER.
11. WET WELL SHALL BE TESTED FOR HYDRAULIC LEAKS PRIOR TO PLACING INTO OPERATION, RE: SPECIFICATIONS.
12. ALL BURIED DUCTILE IRON PIPE TO BE INSTALLED IN PE WRAP; RE: SPECS

SHEET KEYNOTES

01	4" 90° BEND
02	6" x 3" TEE
03	VENDOR PROVIDED STAINLESS STEEL GUIDE RAIL SYSTEM WITH BRACKETS
04	HS-20 RATED 4' x 6' ALUMINUM ACCESS HATCH WITH FALL PROTECTION, RE: SPEC & STD DTL M250
05	PIPE SUPPORT, RE: M018
06	2" COMBINATION AIR VALVE, RE: SPEC & STD DTL M140. PIPE TO DRAIN.
07	PIPE PENETRATION, RE: STD DTL M253
08	6" DISMANTLING JOINT
09	MANHOLE STEPS, RE: C6028
10	4" DUCK BILL CHECK VALVE, RE: SPEC
11	4" FLEXIBLE COUPLING
12	GROUT SLOPE TOWARDS DRAIN
13	HS-20 RATED 4' x 4' ALUMINUM ACCESS HATCH, RE: SPEC & STD DTL M239
14	PRECAST CONCRETE UTILITY VAULT, RE: SPEC
15	8'-0" INSIDE DIAMETER PRECAST WET WELL AND BASE, RE: SPEC
16	GROUT INTERIOR OF MANHOLE. PROVIDE CLEAR SPACE AROUND PUMPS, RE: MANUFACTURER'S RECOMMENDATION
17	3" MALE CAMLOCK
18	ELECTRICAL CONDUIT, RE: E-101-A
19	WAGER 1800 ODOR CONTROL UNIT WITH RAIN SHIELD; FITTINGS AS NECESSARY; PROVIDE SUBMITTAL PRIOR TO ORDERING.
20	PIPE SUPPORT, RE: M024 OR M030
21	4" DISMANTLING JOINT
22	4" SURESEAL WATERLESS INLINE DRAIN TRAP OR EQUAL
23	6" FLEXIBLE COUPLING
24	FLOAT SWITCH WITH BRACKET, RE: M297 & INSTRUMENTATION

EQUIPMENT KEYNOTES

CV-A110	4" CHECK VALVE, RE: SPEC
FE-A100	6" FLOW METER, RE: SPEC
HV-A110	4" PLUG VALVE, RE: SPEC
HV-A120	3" PLUG VALVE, RE: SPEC
PI-A110	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PMP-A110	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00

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601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - MECHANICAL SECTION

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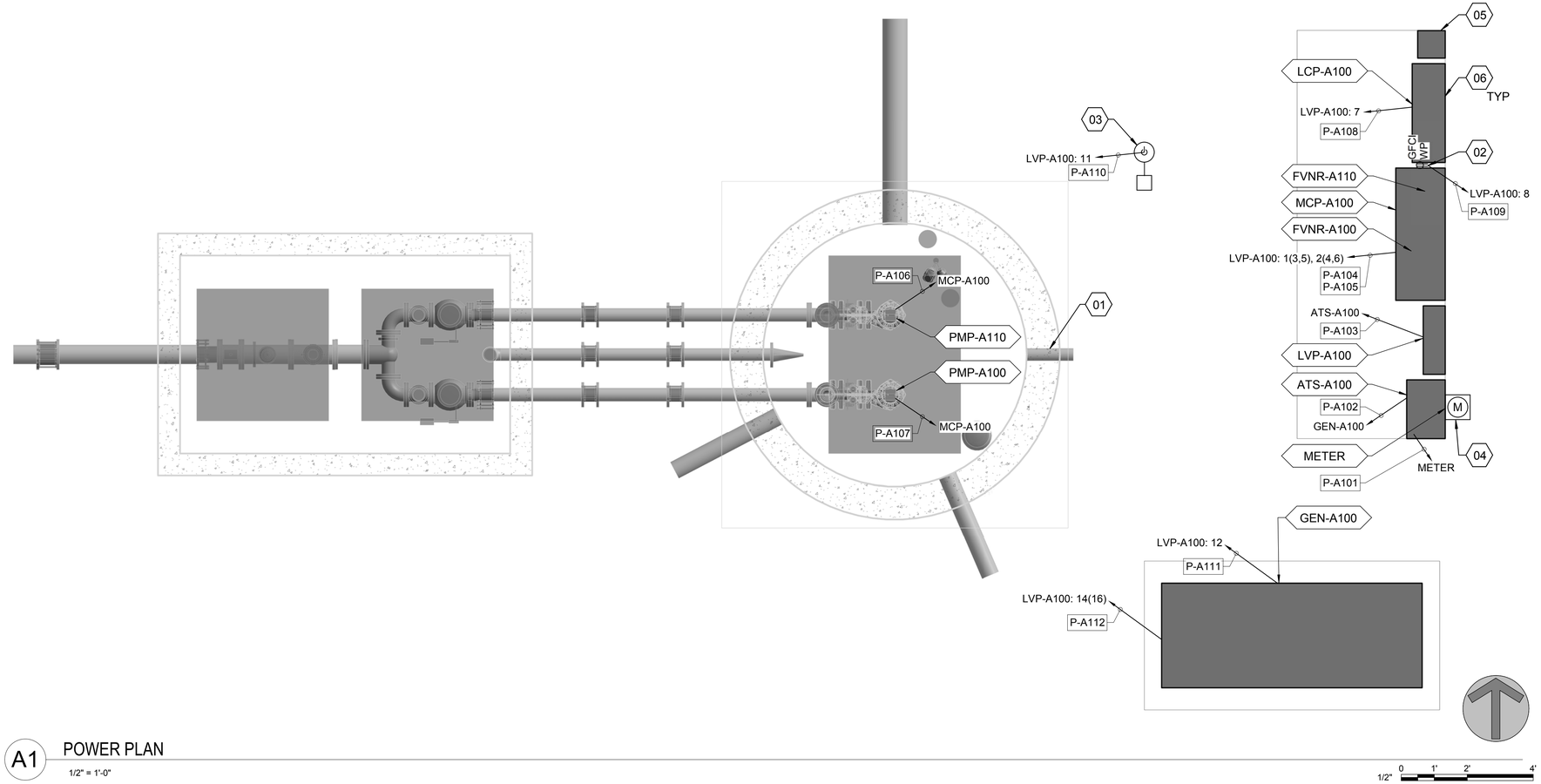
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PROJECT NO. 223072 PAGE

SHEET NO. M-301-A

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A1 POWER PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. RE: E-601-A PANEL SCHEDULE.
2. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
3. ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND ANY OTHER STATE OR LOCAL CODE.
4. CABLE AND CONDUIT RUNS ARE DIAGRAMMATICALLY SHOWN ON THE DRAWINGS. FINAL ROUTING SHALL BE DETERMINED BY THE ELECTRICAL CONTRACTOR AND APPROVED BY THE OWNER.
5. ALL OUTDOOR EQUIPMENT AND WIRING SHALL BE WEATHER PROOF.
6. RE: G-006 FOR EQUIPMENT RESPONSIBILITY MATRIX.

SHEET KEYNOTES

01 ROUTE ALL CONDUITS THROUGH COMMON PENETRATION AT WET WELL.

02 PROVIDE GFCI RECEPTACLE IN WEATHERPOOF BOX MOUNTED ON EQUIPMENT RACK.

03 SITE LIGHT TO BE LITHONIA DSX1-LED-P3-40K-70CRI-T1S-MVOLT-SPA-HS-DDBXD OR APPROVED EQUAL. POLE TO BE KW SSP15-4-11-BRZ-DM10-BC OR APPROVED EQUAL. RE:E027/E-501 COORDINATE WITH OWNER FOR EXACT LOCATION OF LIGHT.

04 MOUNT METER 5' 6" ABOVE FINISHED GRADE ON OPPOSITE SIDE OF EQUIPMENT RACK. COORDINATE WITH AVISTA FOR CONNECTION.

05 RE:A011/E-501 FOR RACK MOUNT DETAIL.

06 ALL ELECTRICAL EQUIPMENT TO BE INSTALLED 2' ABOVE FLOOD PLANE PER NEC. TOP OF CONCRETE AT FLOOD PLANE ELEVATION: 2074'.

EQUIPMENT KEYNOTES

ATS-A100	AUTOMATIC TRANSFER SWITCH
FVNR-A100	PUMP #1 MOTOR STARTER
FVNR-A110	PUMP #2 MOTOR STARTER
GEN-A100	NATURAL GAS GENERATOR
LCP-A100	LOCAL CONTROL PANEL
LVP-A100	POWER PANEL
MCP-A100	MOTOR CONTROL PANEL
METER	UTILITY METER
PMP-A100	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00
PMP-A110	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00

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601 East Sherman Avenue, Suite 1
Coeur dAlene, ID 83814
(208) 758-8601

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STATE OF IDAHO
BRADLEY M. CULVER

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LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - POWER PLAN

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GENERAL SHEET NOTES

1. THE PATTERNED AREAS (SEE BELOW) INDICATE BUILDING OR STRUCTURE CLASSIFICATION. FOR FULL EXTENT REFER TO NFPA 820 FOR LIMITS OF CLASSIFIED AREAS. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL EQUIPMENT MEETING HAZARDOUS LOCATION REQUIREMENTS WHERE REQUIRED BY CODE AND AHJ.

SHEET KEYNOTES

01 INTERIOR OF VALVE VAULT IS CLASS I, DIV 2.

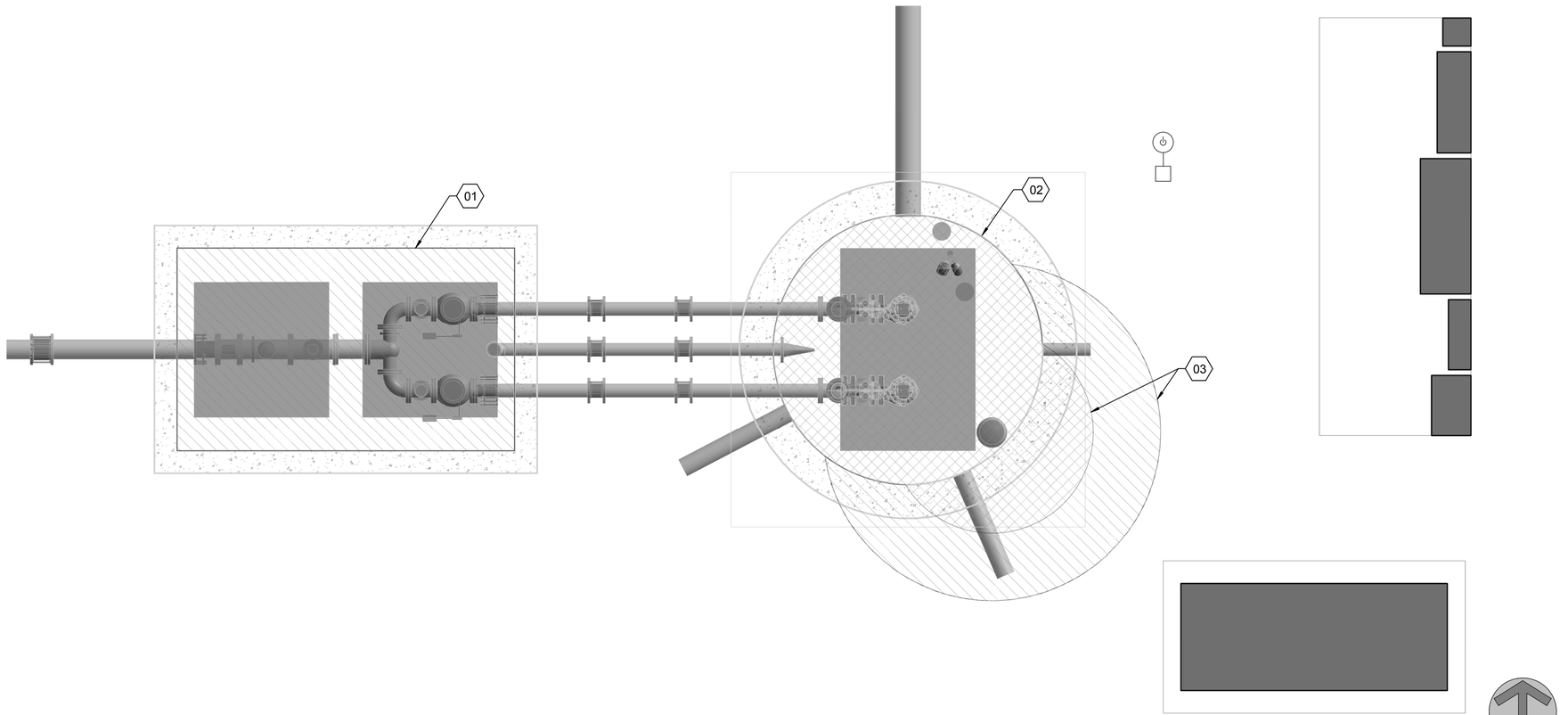
02 INTERIOR OF WET WELL IS CLASS I, DIV 1.

03 5 FOOT RADIUS OF WET WELL VENT IS CLASS I, DIV 2 AND 3 FOOT RADIUS OF VENT IS CLASS I, DIV 1.

LEGEND

CLASS I, DIV 1

CLASS I, DIV 2



A1 ELECTRICAL CLASSIFICATION PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

KELLER ASSOCIATES
601 East Sherman Avenue, Suite 1
Coeur dAlene, ID 83814
(208) 758-8601

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LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - ELECTRICAL AREA CLASSIFICATION

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ELECTRICAL CABLE AND CONDUIT SCHEDULE

CONDUIT TAG	REF. SHEET	CONDUIT SPEC*	CABLE SPEC	SERVICE	DESCRIPTION	ORIGIN	DESTINATION	NOTES
P-A101	E-601-A, E-101-A	1 1/2"	(4) #3, #8 GND	240V	MAIN POWER	UTILITY METER	ATS-A100	
P-A102	E-601-A, E-101-A	1 1/2"	(4) #3, #8 GND	240V	GENERATOR FEEDER	GEN-A100	ATS-A100	
P-A103	E-601-A, E-101-A	1 1/2"	(4) #3, #8 GND	240V	MAIN POWER PANEL FEEDER	ATS-A100	LVP-A100	
P-A104	E-601-A, E-101-A	3/4"	(3) #10, #10 GND	240V	PUMP 1 STARTER POWER	LVP-A100	MCP-A100	
P-A105	E-601-A, E-101-A	3/4"	(3) #10, #10 GND	240V	PUMP 2 STARTER POWER	LVP-A100	MCP-A100	
P-A106	E-601-A, E-101-A	1 1/2"	VENDOR CABLE	240V	PUMP 2 FEEDER	MCP-A100	PMP-A110	TERMINATE VENDOR CABLE AT SEAL OFF. CONTINUE TO MCP-A100
P-A107	E-601-A, E-101-A	1 1/2"	VENDOR CABLE	240V	PUMP 1 FEEDER	MCP-A100	PMP-A100	TERMINATE VENDOR CABLE AT SEAL OFF. CONTINUE TO MCP-A100
P-A108	E-101-A	3/4"	(2) #12, #12 GND	120V	LOCAL CONTROL PANEL	LVP-A100	LCP-A100	
P-A109	E-101-A	3/4"	(2) #12, #12 GND	120V	SITE RECEPTACLE	LVP-A100	SITE RECEPTACLE	
P-A110	E-101-A	3/4"	(2) #12, #12 GND	120V	SITE LIGHT	LVP-A100	SITE LIGHT	
P-A111	E-101-A	3/4"	(2) #12, #12 GND	120V	GENERATOR BATTERY CHARGER	LVP-A100	GEN-A100	
P-A112	E-101-A	3/4"	(3) #12, #12 GND	240V	GENERATOR BLOCK HEATER	LVP-A100	GEN-A100	

***NOTE:** CONDUIT SPECIFICATION IS INDICATIVE OF THE TYPE OF INSTALLATION REQUIRED FOR MAJORITY OF CABLE ROUTING. EC IS RESPONSIBLE FOR ALL WIRING METHODS AND MATERIALS INCLUDING CONDUIT TRANSITIONS, SUPPORTS, PENETRATIONS, ETC., AS REQUIRED FOR A COMPLETE INSTALLATION AND MEETING ALL REQUIREMENTS OF ARTICLE 300 OF THE NATIONAL ELECTRIC CODE.

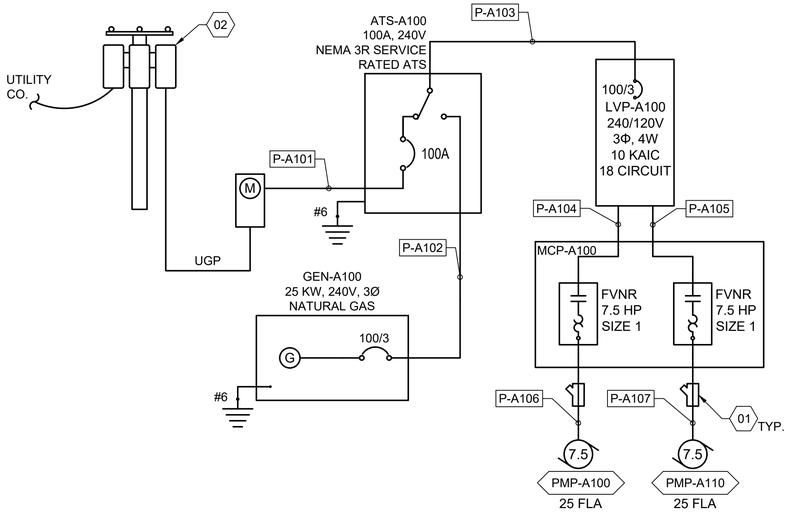
GENERAL SHEET NOTES

1. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
2. COORDINATE WORK AND ROUGH-IN LOCATIONS WITH RELATED TRADES.
3. ROUTE CONDUIT IN COMMON TRENCH WHENEVER POSSIBLE.
4. CONTRACTOR SHALL PROVIDE & CHECK CIRCUIT BREAKER POSITIONS.
5. CONTRACTOR SHALL PROVIDE NEW UPDATED DIRECTORIES FOR ALL PANELS IN WHICH CIRCUITS ARE ADDED OR REMOVED. DELETED CIRCUITS SHALL BE MARKED SPARE.
6. ALL ELECTRICAL EQUIPMENT SHALL BE FIELD MARKED PER THE NEC 110.16 "POTENTIAL ELECTRIC ARC FLASH HAZARD".
7. PROVIDE BREAKERS WITH LOCK OUT TAG OUT PROVISIONS.

SHEET KEYNOTES

01 PROVIDE SEAL OFFS AT BASE OF EQUIPMENT RACK. FOR CLASSIFICATION DRAWING RE: E-125-A

02 COORDINATE WITH AVISTA UTILITIES FOR NEW INCOMING SERVICE.



A1 ONE-LINE DIAGRAM
N.T.S.

PANEL NAME: LVP-A100

LOCATION: PANEL RACK
FED FROM: ATS-A100
MOUNTING: RACK
VOLTAGE: 240V/120
PHASE & WIRE: 3PH 4W
AIC RATING: 10K
ENCLOSURE: N3R
BUS: 125A
FEED: BOTTOM
MAIN BREAKER: 100A
SPACES: 18
NOTES:

NOTES	CIRCUIT DESCRIPTION	CODE	LOAD	POLE	BKR	CKT	PH	CKT	BKR	POLE	LOAD	CODE	CIRCUIT DESCRIPTION	NOTES
	PMP-A100		3464	3	60	1	A	2	60	3	3464		PMP-A110	
			3464			3	B	4			3464			
			3464			5	C	6			3464			
	LCP-A100		500	1	20	7	A	8	20	1	180		SITE RECEPTACLE	
						9	B	10						
	SITE LIGHT		51	1	20	11	C	12	20	1	1200		GENERATOR BATTERY CHARGER	
						13	A	14	20	1	750		GENERATOR BLOCK HEATER	
						15	B	16			750			
						17	C	18						

CONNECTED VA PHASE A:	8358	% CONNECTED VA PHASE A:	35%
CONNECTED VA PHASE B:	7678	% CONNECTED VA PHASE B:	32%
CONNECTED VA PHASE C:	8179	% CONNECTED VA PHASE C:	34%

DIVERSITY:	1.00	TOTAL VA:	24215
		CONNECTED AMPS:	58
		DIVERSIFIED AMPS:	58

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - ONE-LINE DIAGRAM

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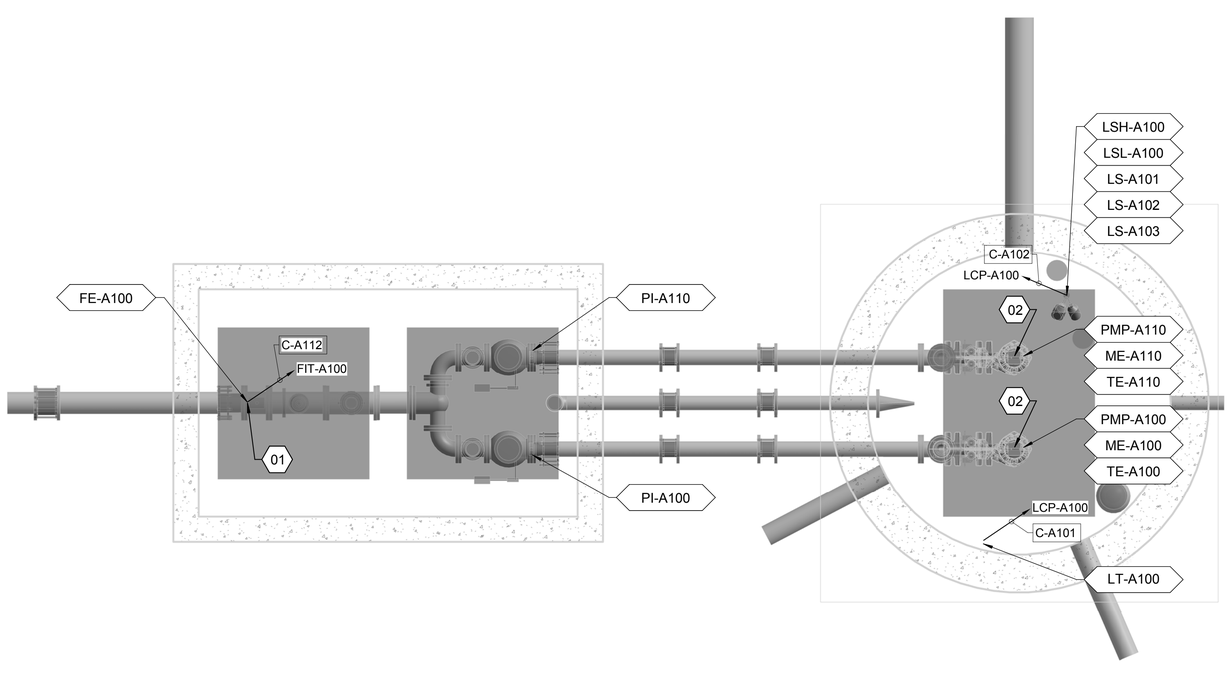
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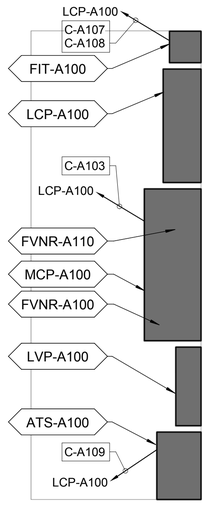
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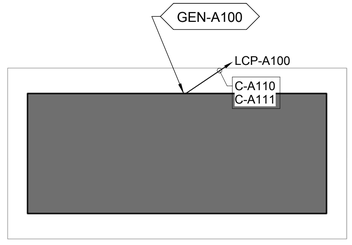
CONTROL CABLE AND CONDUIT SCHEDULE

CONDUIT TAG	REF. SHEET	*CONDUIT SPEC	CABLE SPEC	SERVICE	DESCRIPTION	ORIGIN	DESTINATION	NOTES
C-A101	EI-101-A	3/4"	1PR #18 TWOS	ANALOG	SUBMERSIBLE LEVEL TRANSMITTER SIGNALS	LCP-A100	LT-A100	PROVIDE SEAL-OFF AT LCP-A100
C-A102	EI-101-A	3/4"	(5) 2/C #16	DISCRETE	WET WELL LEVEL SWITCH SIGNALS	LCP-A100	LSH-A100, LSL-A100, LS-A101, LS-A102, LS-A103	PROVIDE SEAL-OFF AT LCP-A100
C-A103	EI-101-A	1"	(2) CAT6	ETHERNET	FVNR SIGNALS	LCP-A100	MCP-A100	
C-A104								
C-A105								
C-A106								
C-A107	EI-101-A	3/4"	1PR #18 TWOS, 2/C #16	ANALOG/DISCRETE	FLOW METER SIGNALS	LCP-A100	FIT-A100	
C-A108	EI-101-A	3/4"	(2) #14, #14 GND	POWER	FLOW METER POWER	LCP-A100	FIT-A100	
C-A109	EI-101-A	3/4"	(3) 2/C #16	DISCRETE	ATS SIGNALS	LCP-A100	ATS-A100	
C-A110	EI-101-A	3/4"	1PR #18 TWOS, (3) 2/C #16	ANALOG/DISCRETE	GENERATOR SIGNALS	LCP-A100	GEN-A100	
C-A111	EI-101-A	3/4"	(3) 2/C #16	DISCRETE	ATS TO GENERATOR SIGNALS	ATS-A100	GEN-A100	
C-A112	EI-101-A	3/4"	BY MANUFACTURER	ANALOG	FLOW ELEMENT SIGNALS	FE-A100	FIT-A100	COORDINATE WITH MANUFACTURER FOR CABLE LENGTH. PROVIDE SEAL-OFF

***NOTE: CONDUIT SPECIFICATION IS INDICATIVE OF THE TYPE OF INSTALLATION REQUIRED FOR THE MAJORITY OF THE CABLE ROUTING. EC IS RESPONSIBLE FOR ALL WIRING METHODS AND MATERIALS INCLUDING CONDUIT TRANSITIONS, SUPPORTS, PENETRATIONS, ETC., AS REQUIRED FOR A COMPLETE INSTALLATION AND MEETING ALL REQUIREMENTS OF ARTICLE 300 OF THE NATIONAL ELECTRIC CODE.**
EC MAY COMBINE LOW VOLTAGE SIGNAL CABLES IN SAME CONDUITS AND RACEWAYS WHERE APPROPRIATE FOR ROUTING AND MAY INCREASE CONDUIT SIZE AS NEEDED FOR GROUPED CABLES. INSTRUMENT, SIGNAL, AND NETWORK CABLES ARE TO BE SEPARATED FROM POWER CONDUCTORS.
CABLE VOLTAGE > 50V SHALL BE ROUTED IN A SEPARATE RACEWAY OR SEGREGATED VIA PHYSICAL BARRIER SEPARATION AND/OR MINIMUM DISTANCE OF 12 IN. FROM SIGNAL CABLES, MAINTAINED FOR ENTIRE LENGTH OF CABLE RUN.







A1 INSTRUMENTATION PLAN
1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
2. COORDINATE WORK AND ROUGH-IN LOCATIONS WITH RELATED TRADES.
3. ROUTE CONDUIT IN COMMON TRENCH WHENEVER POSSIBLE.
4. COORDINATE WITH SCADA INTEGRATOR.
5. COORDINATE FINAL CABLE SPECIFICATIONS AND TERMINATIONS TO EQUIPMENT WITH MANUFACTURER PROVIDED.
6. RE: G-006 FOR EQUIPMENT RESPONSIBILITY MATRIX.

SHEET KEYNOTES

01 CONTRACTOR TO COORDINATE WITH MANUFACTURER FOR LENGTH OF VENDOR CABLE FROM FLOW ELEMENT TO FLOW INDICATING TRANSMITTER.

02 TEMPERATURE AND MOISTURE ELEMENT CABLES ARE INTEGRATED INTO POWER CABLE, RE:E-101-A FOR CONDUIT SCHEDULE.

EQUIPMENT KEYNOTES

ATS-A100	AUTOMATIC TRANSFER SWITCH
FE-A100	6" FLOW METER, RE: SPEC
FIT-A100	FLOW INDICATING TRANSMITTER
FVNR-A100	PUMP #1 MOTOR STARTER
FVNR-A110	PUMP #2 MOTOR STARTER
GEN-A100	NATURAL GAS GENERATOR
LCP-A100	LOCAL CONTROL PANEL
LS-A101	LEVEL FLOAT, RE: STD DTL M297
LS-A102	LEVEL FLOAT, RE: STD DTL M297
LS-A103	LEVEL FLOAT, RE: STD DTL M297
LSH-A100	LEVEL FLOAT, RE: STD DTL M297
LSL-A100	LEVEL FLOAT, RE: STD DTL M297
LT-A100	LEVEL TRANSMITTER, RE: STD DTL M901
LVP-A100	POWER PANEL
MCP-A100	MOTOR CONTROL PANEL
ME-A100	MOISTURE ELEMENT
ME-A110	MOISTURE ELEMENT
PI-A100	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PI-A110	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PMP-A100	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00
PMP-A110	SUBMERSIBLE CHOPPER PUMP, RE: SPEC 43 20 00
TE-A100	TEMPERATURE ELEMENT
TE-A110	TEMPERATURE ELEMENT

KELLER ASSOCIATES
601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

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STATE OF IDAHO
BRADLEY M. CULVER

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LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - INSTRUMENTATION PLAN

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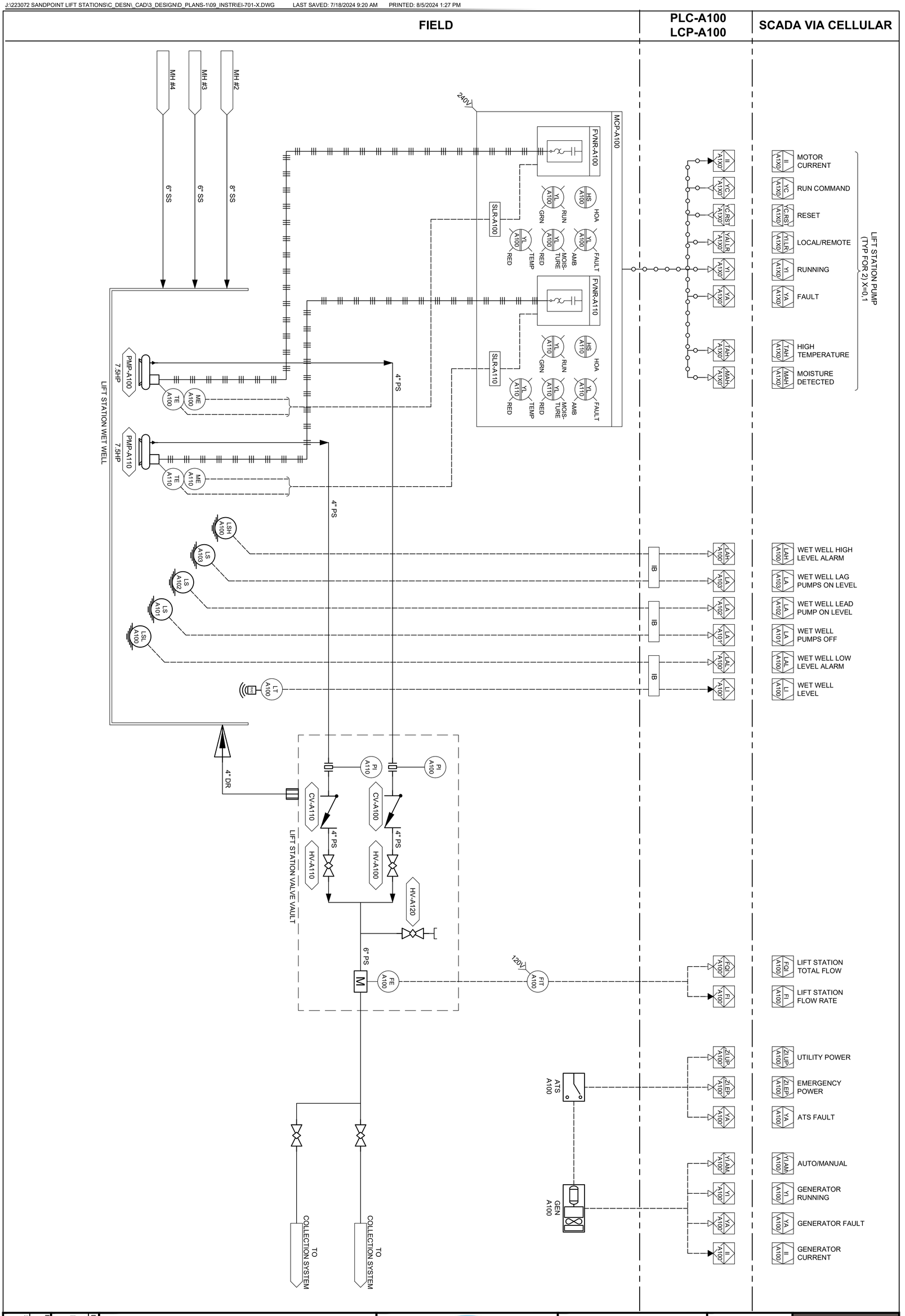
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LIFT STATION REPLACEMENTS

CITY BEACH LIFT STATION - P&ID

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Coeur d'Alene, Idaho 83814
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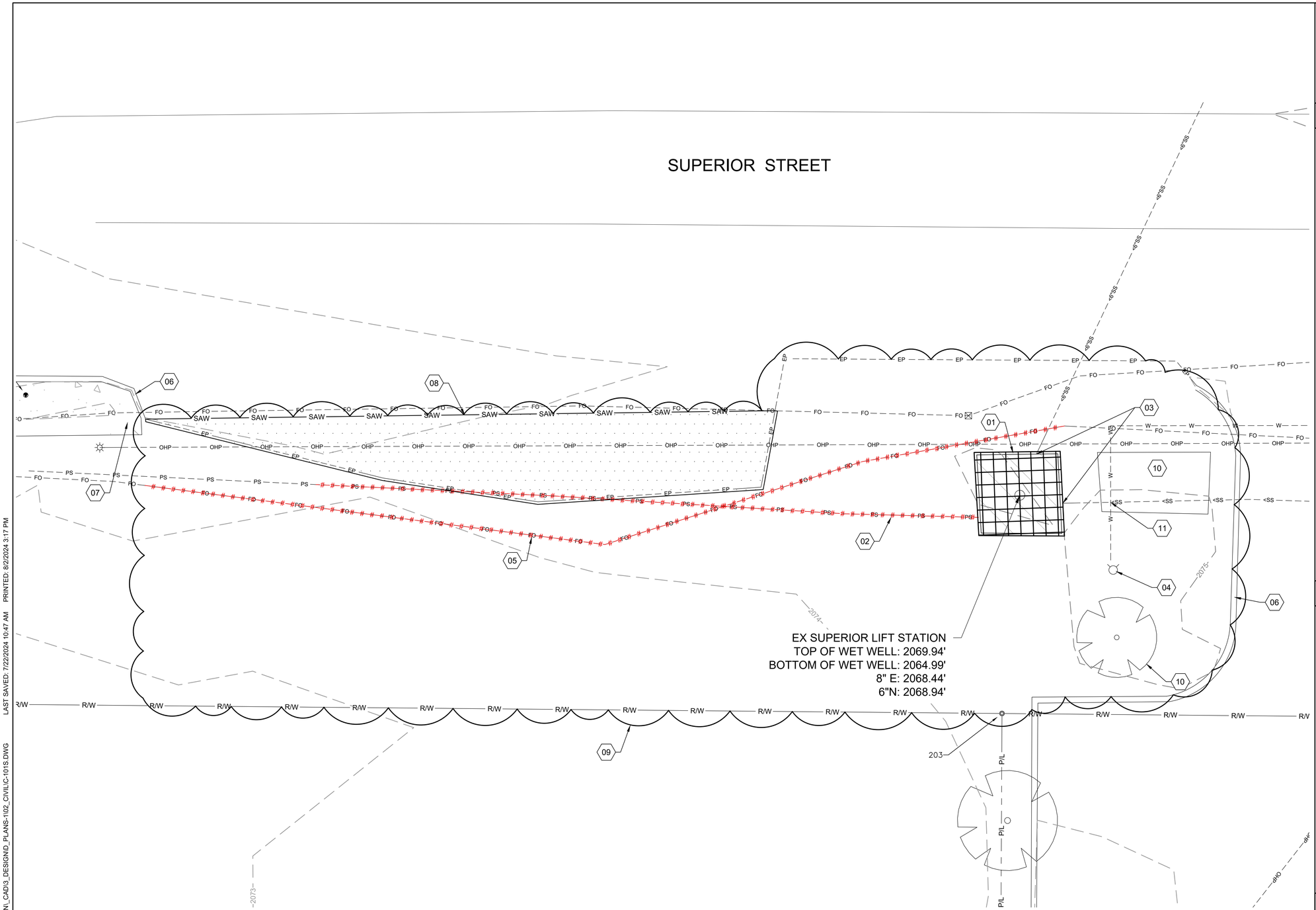
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GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. CONTRACTOR TO DISPOSE OF DEMOLISHED STRUCTURES, EQUIPMENT AND OTHER MATERIALS OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS AND THE PROJECT SPECIFICATIONS UNLESS NOTED OTHERWISE. IN GENERAL MATERIALS REMOVED FROM THE EXISTING FACILITY WILL NOT BE SALVAGED, HOWEVER CONTRACTOR TO COORDINATE WITH OWNER DURING DEMOLITION TO VERIFY.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REMOVE TREES, SHRUBS, AND VEGETATION WITHIN THE EXTENTS OF CONSTRUCTION AS REQUIRED AND DISPOSE OF MATERIAL OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS UNLESS NOTED OTHERWISE.
5. CONTRACTOR TO COORDINATE DEMOLITION WITH ENGINEER AND OWNER TO ENSURE SEWER SERVICE IS NOT DISRUPTED.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

SHEET KEYNOTES

01 DEMOLISH LIFT STATION PUMPS, MECHANICAL EQUIPMENT, STRUCTURE, CONCRETE SLAB, AND WET WELL. REFER TO WORK SEQUENCE DESCRIBED IN 01 35 13

02 DEMOLISH EXISTING FORCEMAIN (LENGTH MAY VARY); CONTRACTOR TO PROVIDE TEMPORARY FORCEMAIN IN NEW ALIGNMENT TO ENABLE CONSTRUCTION OF NEW FACILITY

03 CONTRACTOR TO CUT AND FIT GRAVITY SEWER PIPES; RE: SITE PLAN

04 RETAIN & PROTECT EXISTING FIRE HYDRANT

05 CONTRACTOR TO POTHOLE AND FIELD VERIFY LOCATION OF FIBER OPTIC LINE FOR RELOCATION

06 RETAIN & PROTECT EXISTING CURB

07 RETAIN & PROTECT EXISTING SIDEWALK

08 DEMOLISH EXISTING ASPHALT

09 DEMOLITION LIMITS/LIMITS OF CONSTRUCTION. ALL WORK AND ON-SITE STORAGE TO BE CONTAINED WITHIN THIS AREA

10 EXISTING VEGETATION; SEE GENERAL NOTE 4

11 RETAIN & PROTECT EXISTING POTABLE / NON-POTABLE CROSSING

DEMO LEGEND

REMOVE STRUCTURE

REMOVE ASPHALT

ABANDON PIPE

REMOVE PIPE

EXTENT OF DEMOLITION/LIMITS OF CONSTRUCTION

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601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSE 17127 8/6/2024 STATE OF IDAHO KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION DEMOLITION PLAN

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VERIFY SCALE: Scales based on 22"x34" prints.

1-1/2 Inches

PROJECT NO. 223072

PAGE

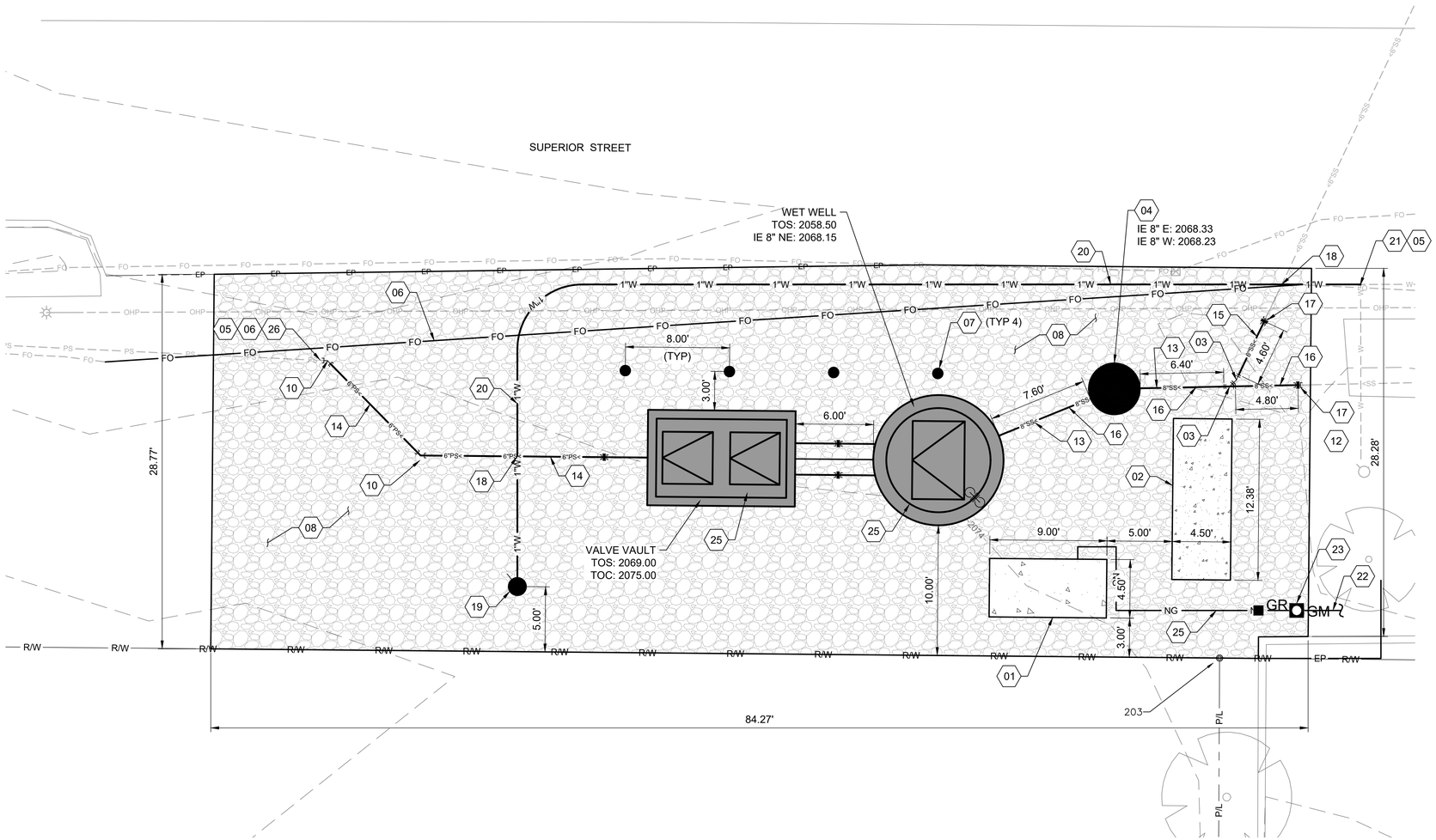
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SURVEY MONUMENTS	
POINT	DESCRIPTION
202	5/8" REBAR WITH CAP LS7879
203	5/8" REBAR WITH CAP LS5087
204	5/8" REBAR NO CAP

PROJECT CONTROL				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	2409466.69	2431345.52	2069.91	5/8" REBAR WITH CAP KELLER CONTROL (OFF-SITE)
4	2408711.34	2430600.26	2074.00	MAGNAIL KELLER CONTROL
5	2408643.13	2430704.94	2073.76	MAGNAIL KELLER CONTROL



GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. FURNISH MATERIALS WHERE "INSTALL", "PLACE" OR "CONSTRUCT" IS REQUIRED UNLESS NOTED OTHERWISE.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REMOVE TREES, SHRUBS, AND VEGETATION WITHIN THE EXTENTS OF CONSTRUCTION AS REQUIRED AND DISPOSE OF MATERIAL OFFSITE AT A LOCATION DETERMINED BY THE CONTRACTOR IN ACCORDANCE WITH STATE AND FEDERAL LAWS UNLESS NOTED OTHERWISE.
5. ALL BURIED METAL PIPE TO BE INSTALLED IN PE WRAP; RE: SPEC.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

SHEET KEYNOTES

01 INSTALL 18-INCH THICK CONCRETE GENERATOR PAD; RE: ELECTRICAL & STD DTL C1421. PROVIDE MINIMUM MAT REINFORCEMENT OF #5 @ 12" O.C., E-W. EXCAVATION PER C1/C-503.

02 INSTALL 9-INCH THICK CONCRETE PAD FOR CONTROL PANEL, RE: ELECTRICAL & C1422. EXCAVATION PER C1/C-503.

03 INSTALL FITTING - 6" x 8" SANITARY REDUCING WYE

04 INSTALL 48" MANHOLE; RE: STD DTL C6002. EXCAVATION PER C1/C-503.

05 CONTRACTOR TO POTHOLE AND FIELD VERIFY CONNECTION LOCATION

06 RELOCATED FIBER OPTIC LINE

07 INSTALL REMOVABLE BOLLARD; RE: STD DTL C0121

08 CONSTRUCT TYPE C SURFACE RESTORATION; RE: ISPWC SD-303

09 INSTALL FITTING - 6" 22.5° BEND

10 INSTALL FITTING - 6" 45° BEND

11 CONTRACTOR TO CONNECT TO EXISTING SERVICE LATERAL WITH REQUIRED FITTINGS

12 CONSTRUCT MISCELLANEOUS SURFACE REPAIR - TOP SOIL AND GRASS SEED PER ISPWC.

13 GRAVITY SEWER PIPE; CONNECT TO EXISTING LINE AT MINIMUM SLOPE 0.4% OR GREATER.

14 INSTALL PIPE - 6" PS (13.D), RE: STD DTL C3011

15 INSTALL PIPE - 6" SS (12.A), RE: STD DTL C3011

16 INSTALL PIPE - 8" SS (12.A), RE: STD DTL C3011

17 CONNECT TO EXISTING PIPE WITH MAXADAPTOR, MATCH PIPE SIZE

18 POTABLE/NON-POTABLE CROSSING; RE: STD DTL C3001

19 INSTALL YARD HYDRANT ASSEMBLY; RE: STD DTL C7054

20 INSTALL PIPE - 1" W (20.C), RE: STD DTL C3011

21 INSTALL SERVICE LINE, CONNECT TO EXISTING; RE: A4/C-502

22 NATURAL GAS PIPING BY AVISTA UTILITIES

23 NATURAL GAS METER AND REGULATOR BY AVISTA. VERIFY LOCATION WITH AVISTA.

24 INSTALL PIPE TO GENERATOR CONNECTION IN ACCORDANCE WITH AVISTA REQUIREMENTS AND RECOMMENDATIONS; PROVIDE WITH SHUTOFF VALVE, PRESSURE REGULATOR, AND FLEX CONNECTION. VERIFY POINT OF CONNECTION WITH GENERATOR VENDOR.

25 EXCAVATION PER C1/C-503.

26 CONNECT TO EXISTING CLAY PIPE WITH ROMAC ALPHA COUPLER; FITTINGS AS NECESSARY

NATURAL GAS SHEET NOTES

1. NG PIPING BY AVISTA UTILITIES FROM EXISTING NATURAL GAS LINE TO NATURAL GAS METER ASSEMBLY. RETAIN AND PROTECT EXISTING NG PIPING DURING CONSTRUCTION. CONTRACTOR TO INSTALL PIPE DOWNSTREAM OF METER ASSEMBLY.
2. NATURAL GAS LINE TO HAVE MINIMUM 3 FEET OF COVER.
3. CONTRACTOR TO COORDINATE GAS LINE CONSTRUCTION WITH GAS COMPANY, AND CITY, AS NECESSARY

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601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION
SITE & UTILITY PLAN

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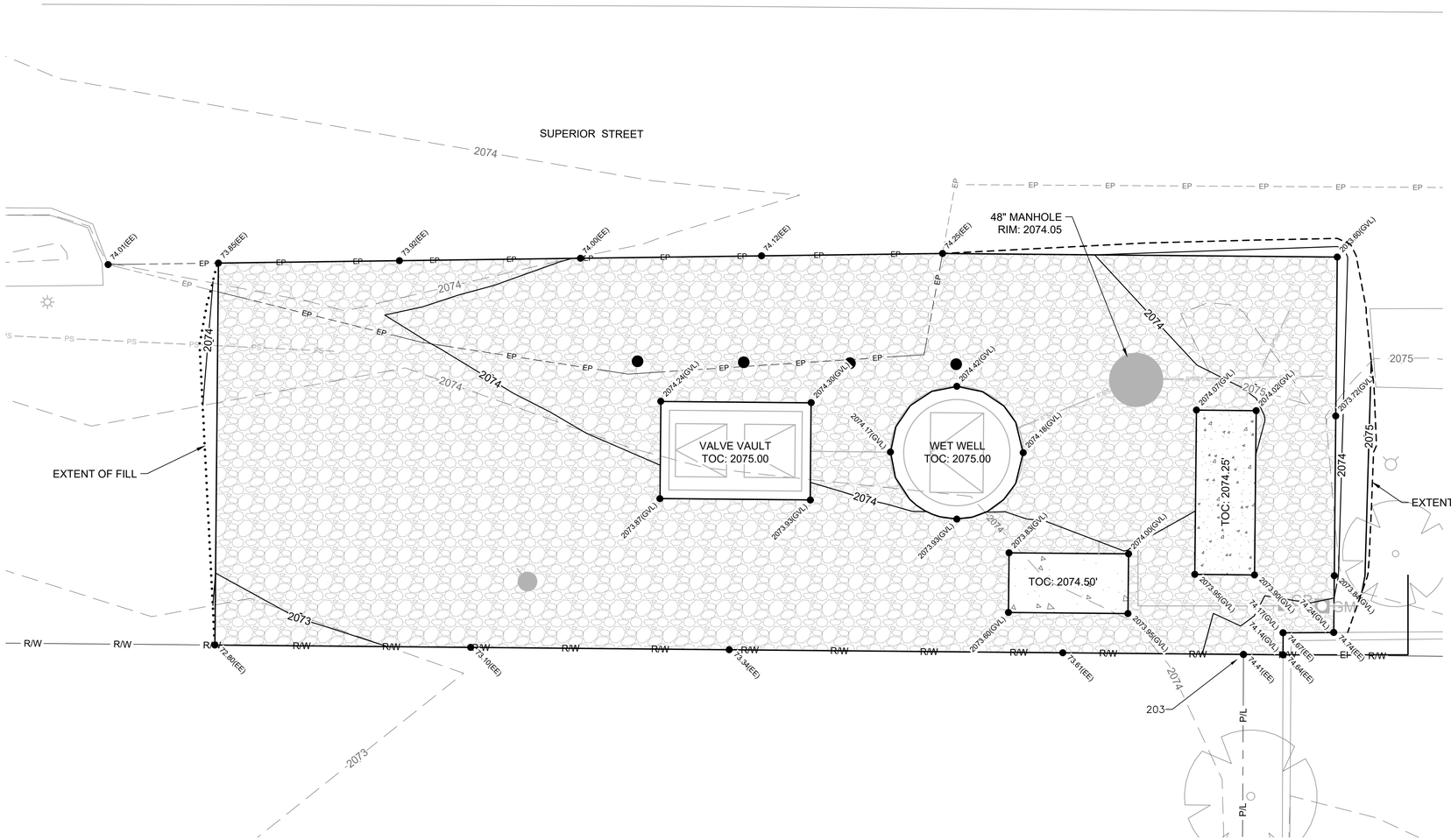
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PROJECT NO. 223072 PAGE

SHEET NO. C-102-B

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GENERAL SHEET NOTES

1. EXISTING UTILITIES ARE SHOWN IN AN APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. SEE UTILITY PLANS FOR MORE INFORMATION.
2. FURNISH MATERIALS WHERE "INSTALL", "PLACE" OR "CONSTRUCT" IS REQUIRED UNLESS NOTED OTHERWISE.
3. AREAS DISTURBED BY CONSTRUCTION WHERE SURFACE REPAIR IS NOT INDICATED SHALL BE RESTORED TO CONDITIONS FOUND PRIOR TO CONSTRUCTION. THIS COST SHALL BE INCIDENTAL TO THE CONTRACT.
4. REFER TO SHEET C-102-A FOR SITE CONTROL & MONUMENTS.
5. ALL BURIED METAL PIPE TO BE INSTALLED IN PE WRAP; RE: SPEC.
6. RETAIN AND PROTECT EXISTING UTILITIES.
7. CONTRACTOR RESPONSIBLE FOR KEEPING EXISTING SEWER SERVICES/COLLECTION SYSTEM OPERATIONAL; SEE SPEC 01 35 13. CONTRACTOR RESPONSIBLE FOR DEVELOPING TEMPORARY BYPASS PLAN FOR WORK. ALL SEWER BYPASS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT. PLAN TO BE REVIEWED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.

ABBREVIATIONS

AC	Top of Asphalt
TOC	Top of Concrete
EE	Existing Elevation
FF	Finished Floor
FG	Finished Grade
FL	Flow Line
FOW	Face of Sidewalk
GVL	Top of Gravel
RIM	Rim of Manhole, Inlet or Catch Basin
TBC	Top Back of Curb
TSW	Top of Sidewalk

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED
Kyle Meschko
DocuSigned by: 08E975A4B5B3498...
17127
8/6/2024
STATE OF IDAHO
KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION
GRADING & DRAINAGE PLAN

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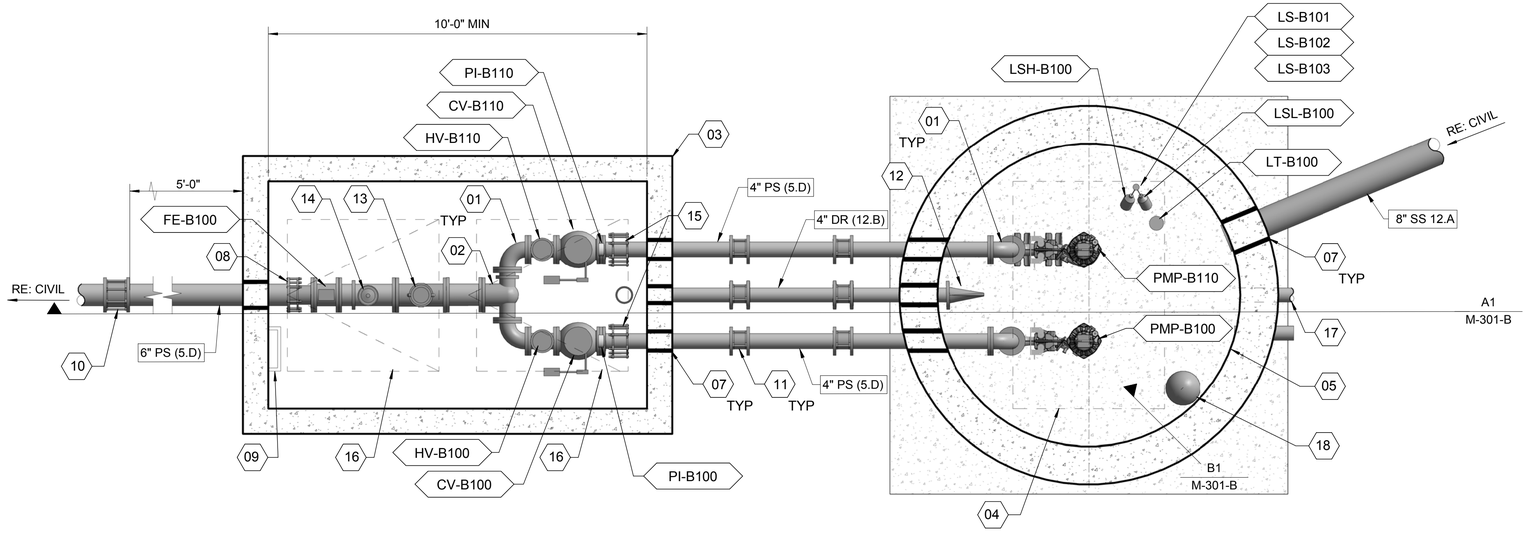
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PROJECT NO. 223072

PAGE

SHEET NO. C-201-B

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A1 MECHANICAL PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. WORK SHALL BE SEQUENCED TO KEEP THE EXISTING LIFT STATION IN OPERATION. COORDINATE WORK IN ACCORDANCE WITH SPECIFICATION SECTION 01 35 13.
2. REFERENCE STANDARD MECHANICAL NOTES, SHEET M-001, FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL SUPPORT PIPING AND VALVES IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 07 AND STD DTLS, RE: M-500 SERIES SHEETS.
4. CONTRACTOR SHALL INSTALL EQUIPMENT AS PER MANUFACTURER'S INSTRUCTIONS.
5. PIPING, VALVES, AND EQUIPMENT SHALL BE COATED IN ACCORDANCE WITH SPECIFICATION SECTION 09 90 00.
6. REFERENCE PIPE SCHEDULE, SHEET G-003, FOR PIPING MATERIALS AND TEST PRESSURES.
7. ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT AND RESTRAINED WITH RETAINER GLANDS OR THRUST BLOCKS AS PER THE SPECIFICATIONS AND DRAWINGS. SEE STD DTL C7204 FOR THRUST BLOCK INSTALLATION.
8. VALVES AND FITTINGS SHALL MATCH PIPE SIZE, TYPE, AND LININGS.
9. ALL HARDWARE, SUPPORTS, AND ANCHORS SHALL BE STAINLESS STEEL IN WET WELL AND VALVE VAULT.
10. CONCRETE FILLET SHALL NOT INTERFERE WITH FLOAT OPERATION. INFLUENT DISCHARGE SHALL NOT CAUSE FLOATS TO SWING. LOCATE AS DIRECTED BY EQUIPMENT SUPPLIER.
11. WET WELL SHALL BE TESTED FOR HYDRAULIC LEAKS PRIOR TO PLACING INTO OPERATION, RE: SPECIFICATIONS.
12. ALL BURIED DUCTILE IRON PIPE TO BE INSTALLED IN PE WRAP; RE: SPECS

SHEET KEYNOTES

01	4" 90° ELBOW
02	6" x 4" TEE
03	PRECAST CONCRETE UTILITY VAULT, RE: SPEC
04	H20 RATED 4' x 6' ALUMINUM ACCESS HATCH WITH FALL PROTECTION, RE: SPEC & STD DTL M250
05	8'-0" INSIDE DIAMETER WET WELL AND BASE. CONTRACTOR TO VERIFY INVERT LOCATIONS AND ELEVATIONS PRIOR TO PURCHASING.
06	PIPE SUPPORT, RE: STD DTL M018
07	PIPE PENETRATION, RE: STD DTL M253
08	6" DISMANTLING JOINT
09	MANHOLE STEPS, RE: STD DTL C6028
10	6" FLEXIBLE COUPLING
11	4" FLEXIBLE COUPLING
12	4" DUCK BILL CHECK VALVE
13	6" x 3" TEE TO BYPASS ASSEMBLY
14	2" COMBINATION AIR VALVE, RE: SPEC & STD DTL M140. PIPE TO DRAIN.
15	4" DISMANTLING JOINT
16	H20 RATED 4' x 4' ALUMINUM ACCESS HATCH, RE: SPEC & STD DTL M239
17	ELECTRICAL CONDUIT, RE: E-101-B
18	WAGER 1800 ODOR CONTROL UNIT WITH RAIN SHIELD; FITTINGS AS NECESSSARY. PROVIDE SUBMITTAL PRIOR TO ORDERING.

EQUIPMENT KEYNOTES

CV-B100	4" CHECK VALVE, RE: SPEC
CV-B110	4" CHECK VALVE, RE: SPEC
FE-B100	6" FLOW METER, RE: SPEC
HV-B100	4" PLUG VALVE, RE: SPEC
HV-B110	4" PLUG VALVE, RE: SPEC
LS-B101	LEVEL FLOAT, RE: STD DTL M297
LS-B102	LEVEL FLOAT, RE: STD DTL M297
LS-B103	LEVEL FLOAT, RE: STD DTL M297
LSH-B100	LEVEL FLOAT, RE: STD DTL M297
LSL-B100	LEVEL FLOAT, RE: STD DTL M297
LT-B100	LEVEL TRANSMITTER, RE: STD DTL M901
PI-B100	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PI-B110	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PMP-B100	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00
PMP-B110	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00

KELLER ASSOCIATES
601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - MECHANICAL PLAN

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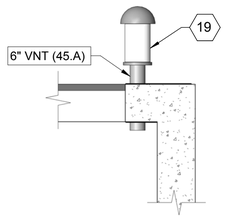
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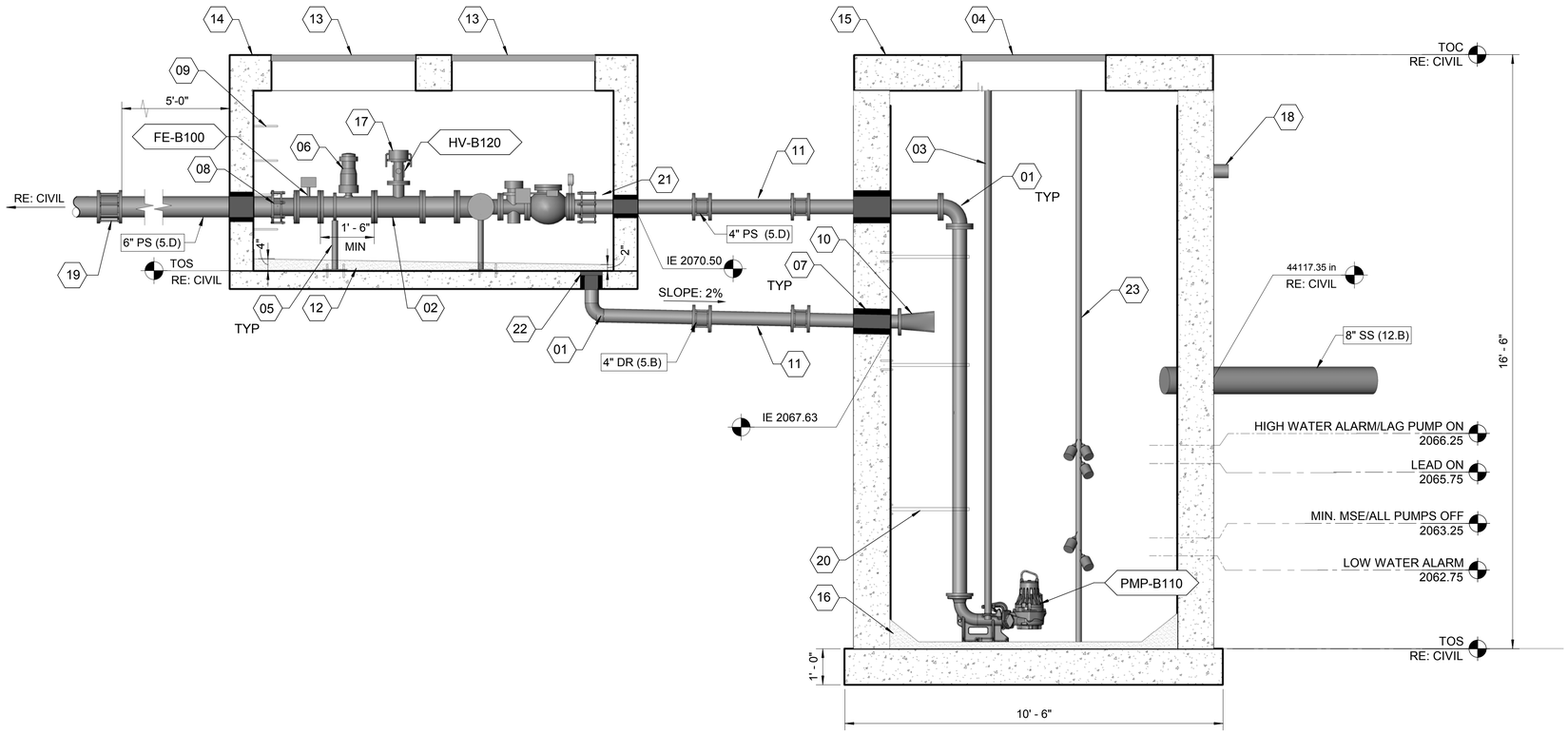
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B1 VENT SECTION

1/2" = 1'-0"

1/2" 0 1' 2' 4'



A1 MECHANICAL SECTION

1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. WORK SHALL BE SEQUENCED TO KEEP THE EXISTING LIFT STATION IN OPERATION. COORDINATE WORK IN ACCORDANCE WITH SPECIFICATION SECTION 01 35 13.
2. REFERENCE STANDARD MECHANICAL NOTES, SHEET M-001, FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL SUPPORT PIPING AND VALVES IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 07 AND STD DTLS, RE: M-500 SERIES SHEETS.
4. CONTRACTOR SHALL INSTALL EQUIPMENT AS PER MANUFACTURER'S INSTRUCTIONS.
5. PIPING, VALVES, AND EQUIPMENT SHALL BE COATED IN ACCORDANCE WITH SPECIFICATION SECTION 09 90 00.
6. REFERENCE PIPE SCHEDULE, SHEET G-003, FOR PIPING MATERIALS AND TEST PRESSURES.
7. ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT AND RESTRAINED WITH RETAINER GLANDS OR THRUST BLOCKS AS PER THE SPECIFICATIONS AND DRAWINGS. SEE STD DTL C7204 FOR THRUST BLOCK INSTALLATION.
8. VALVES AND FITTINGS SHALL MATCH PIPE SIZE, TYPE, AND LININGS.
9. ALL HARDWARE, SUPPORTS, AND ANCHORS SHALL BE STAINLESS STEEL IN WET WELL AND VALVE VAULT.
10. CONCRETE FILLET SHALL NOT INTERFERE WITH FLOAT OPERATION. INFLUENT DISCHARGE SHALL NOT CAUSE FLOATS TO SWING. LOCATE AS DIRECTED BY EQUIPMENT SUPPLIER.
11. WET WELL SHALL BE TESTED FOR HYDRAULIC LEAKS PRIOR TO PLACING INTO OPERATION, RE: SPECIFICATIONS.
12. ALL BURIED DUCTILE IRON PIPE TO BE INSTALLED IN PE WRAP; RE: SPECS

SHEET KEYNOTES

01	4" 90° BEND
02	6" x 3" TEE
03	VENDOR PROVIDED STAINLESS STEEL GUIDE RAIL SYSTEM WITH BRACKETS
04	H20 RATED 4' x 6' ALUMINUM ACCESS HATCH WITH FALL PROTECTION, RE: SPEC & STD DTL M250
05	PIPE SUPPORT, RE: M018
06	2" COMBINATION AIR VALVE, RE: SPEC & STD DTL M140. PIPE TO DRAIN.
07	PIPE PENETRATION, RE: STD DTL M253
08	6" DISMANTLING JOINT
09	MANHOLE STEPS, RE: C6028
10	4" DUCK BILL CHECK VALVE, RE: SPEC
11	4" FLEXIBLE COUPLING
12	GROUT SLOPE TOWARDS DRAIN
13	H20 RATED 4' x 4' ALUMINUM ACCESS HATCH, RE: SPEC & STD DTL M239
14	PRECAST CONCRETE UTILITY VAULT, RE: SPEC
15	8'-0" INSIDE DIAMETER PRECAST WET WELL AND BASE, RE: SPEC
16	GROUT INTERIOR OF MANHOLE. PROVIDE CLEAR SPACE AROUND PUMPS, RE: MANUFACTURER'S RECOMMENDATION
17	3" MALE CAMLOCK
18	ELECTRICAL CONDUIT, RE: E-101-B
19	WAGER 1800 ODOR CONTROL UNIT WITH RAIN SHIELD; FITTINGS AS NECESSARY; PROVIDE SUBMITTAL PRIOR TO ORDERING.
20	PIPE SUPPORT, RE: M024 OR M030
21	4" DISMANTLING JOINT
22	4" SURESEAL WATERLESS INLINE DRAIN TRAP OR EQUAL
23	FLOAT SWITCH WITH BRACKET, RE: M297 & INSTRUMENTATION

EQUIPMENT KEYNOTES

FE-B100	6" FLOW METER, RE: SPEC
HV-B120	3" PLUG VALVE, RE: SPEC
PMP-B110	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00

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601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
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SANDPOINT

LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - MECHANICAL SECTION

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1-1/2 Inches

PROJECT NO. 223072 PAGE

SHEET NO. M-301-B

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SHEET KEYNOTES

01 ROUTE ALL CONDUITS THROUGH COMMON PENETRATION AT WET WELL.

02 PROVIDE GFCI RECEPTACLE IN WEATHERPOOF BOX MOUNTED ON EQUIPMENT RACK.

03 SITE LIGHT TO BE LITHONIA DSX1-LED-P3-40K-70CRI-T1S-MVOLT-SPA-HS-DDBXD OR APPROVED EQUAL. POLE TO BE KW SSP15-4-11-BRZ-DM10-BC OR APPROVED EQUAL. RE:E027/E-501 COORDINATE WITH OWNER FOR EXACT LOCATION OF LIGHT.

04 MOUNT METER 5' 6" ABOVE FINISHED GRADE ON OPPOSITE SIDE OF EQUIPMENT RACK. COORDINATE WITH AVISTA FOR CONNECTION.

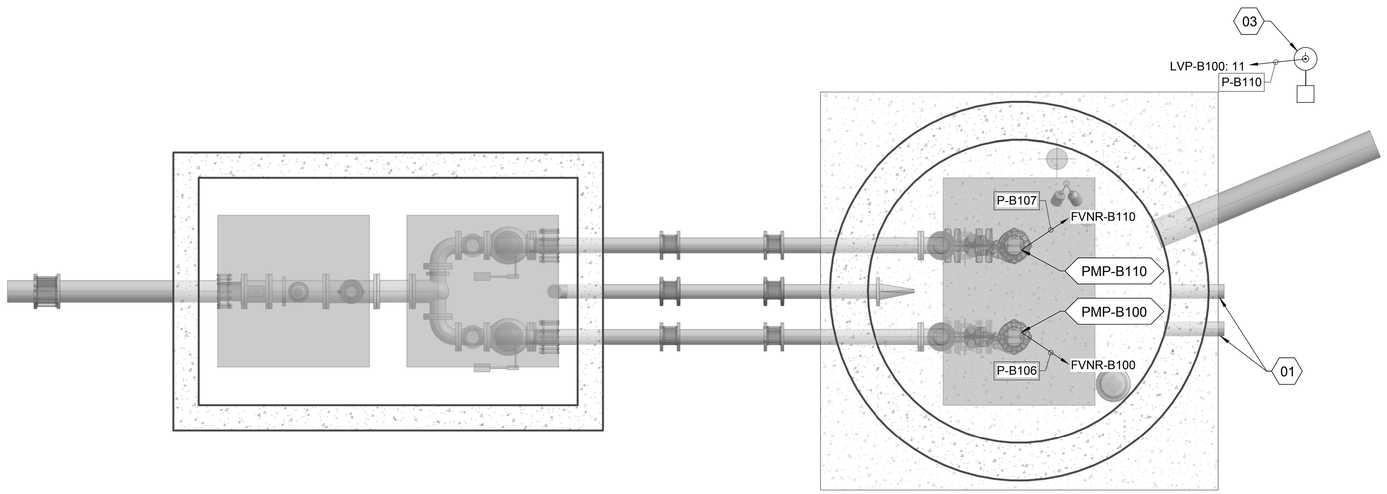
05 RE:A011/E-501 FOR RACK MOUNT DETAIL.

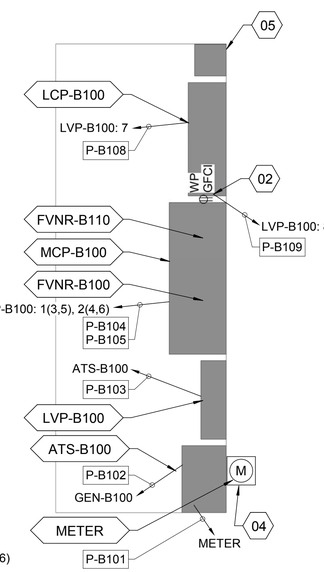
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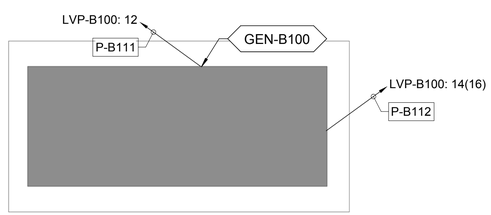
1. RE: E-601-B PANEL SCHEDULE.
2. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
3. ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND ANY OTHER STATE OR LOCAL CODE.
4. CABLE AND CONDUIT RUNS ARE DIAGRAMMATICALLY SHOWN ON THE DRAWINGS. FINAL ROUTING SHALL BE DETERMINED BY THE ELECTRICAL CONTRACTOR AND APPROVED BY THE OWNER.
5. ALL OUTDOOR EQUIPMENT AND WIRING SHALL BE WEATHER PROOF.
6. RE: G-006 FOR EQUIPMENT RESPONSIBILITY MATRIX.

EQUIPMENT KEYNOTES

ATS-B100	AUTOMATIC TRANSFER SWITCH
FVNR-B100	PUMP #1 MOTOR STARTER
FVNR-B110	PUMP #2 MOTOR STARTER
GEN-B100	NATURAL GAS GENERATOR
LCP-B100	LOCAL CONTROL PANEL
LVP-B100	POWER PANEL
MCP-B100	MOTOR CONTROL PANEL
METER	UTILITY METER
PMP-B100	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00
PMP-B110	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00







A1 ELECTRICAL POWER PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

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601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

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19242
8/7/2024
STATE OF IDAHO
BRADLEY M. CULVER

NO.	REVISIONS	DATE

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LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - POWER PLAN

DRAWN: ACM CHECK: BMC

VERIFY SCALE: Scales based on 22"x34" prints.

1-1/2 Inches

PROJECT NO. 223072 PAGE

SHEET NO. E-101-B

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GENERAL SHEET NOTES

1. THE PATTERNED AREAS (SEE BELOW) INDICATE BUILDING OR STRUCTURE CLASSIFICATION. FOR FULL EXTENT REFER TO NFPA 820 FOR LIMITS OF CLASSIFIED AREAS. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL EQUIPMENT MEETING HAZARDOUS LOCATION REQUIREMENTS WHERE REQUIRED BY CODE AND AHJ.

SHEET KEYNOTES

01 INTERIOR OF VALVE VAULT IS CLASS I, DIV 2.

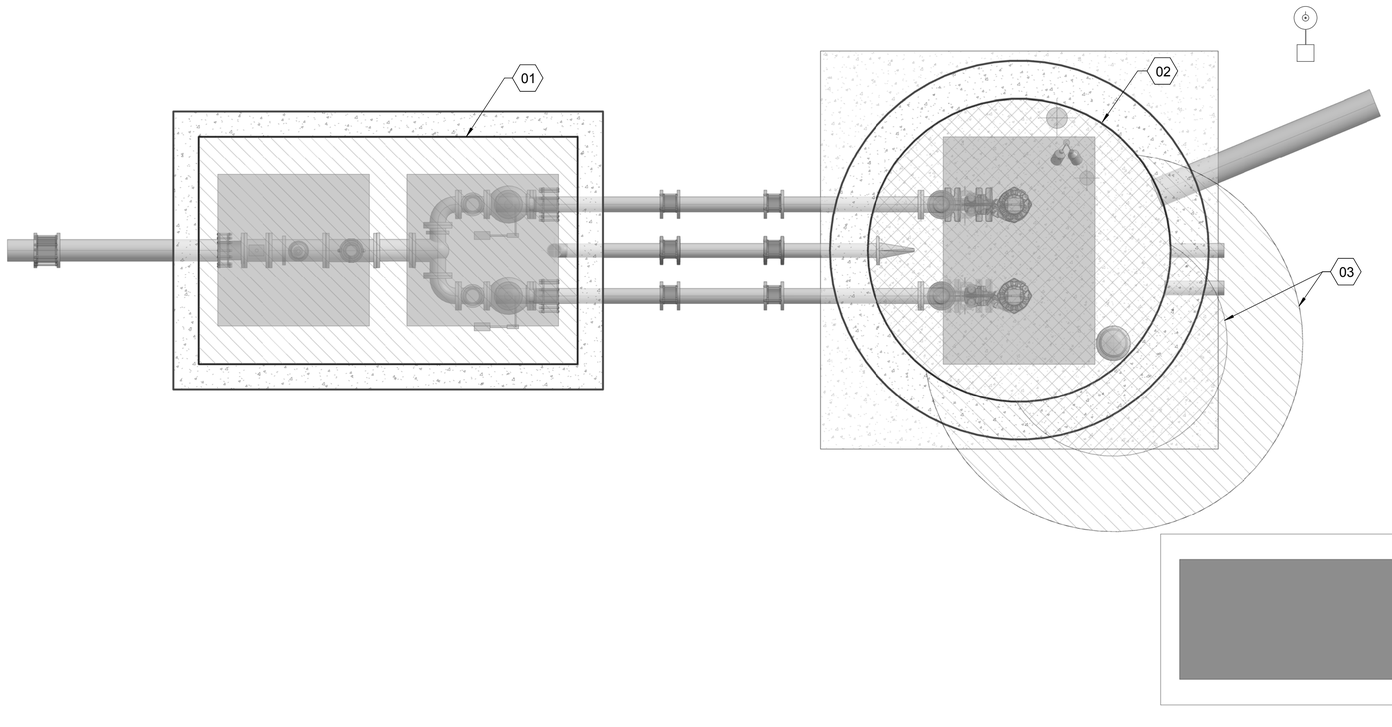
02 INTERIOR OF WET WELL IS CLASS I, DIV 1.

03 5 FOOT RADIUS OF WET WELL VENT IS CLASS I, DIV 2 AND 3 FOOT RADIUS OF VENT IS CLASS I, DIV 1.

LEGEND

CLASS I, DIV 1

CLASS I, DIV 2



A1 ELECTRICAL CLASSIFICATION PLAN

1/2" = 1'-0"

1/2" 0 1' 2' 4'

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Coeur d'Alene, ID 83814
(208) 758-8601

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Date: 2024.08.07 15:22:04 -07'00'
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LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - ELECTRICAL AREA CLASSIFICATION

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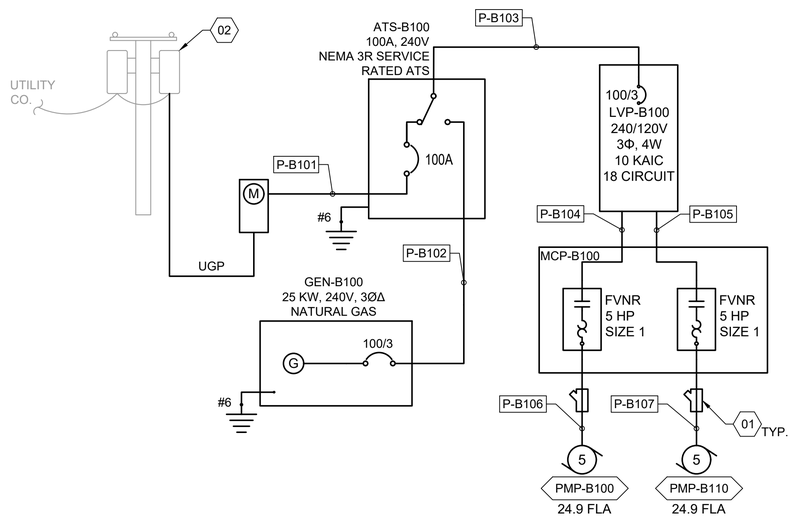
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ELECTRICAL CABLE AND CONDUIT SCHEDULE

CONDUIT TAG	REF. SHEET	CONDUIT SPEC*	CABLE SPEC	SERVICE	DESCRIPTION	ORIGIN	DESTINATION	NOTES
P-B101	E-601-B, E-101-B	1 1/2"	(4) #3, #8 GND	240V	MAIN POWER	UTILITY METER	ATS-B100	
P-B102	E-601-B, E-101-B	1 1/2"	(4) #3, #8 GND	240V	GENERATOR FEEDER	GEN-B100	ATS-B100	
P-B103	E-601-B, E-101-B	1 1/2"	(4) #3, #8 GND	240V	MAIN POWER PANEL FEEDER	ATS-B100	LVP-B100	
P-B104	E-601-B, E-101-B	3/4"	(3) #10, #10 GND	240V	PUMP #1 STARTER POWER	LVP-B100	MCP-B100	
P-B105	E-601-B, E-101-B	3/4"	(3) #10, #10 GND	240V	PUMP #2STARTER POWER	LVP-B100	MCP-B100	
P-B106	E-601-B, E-101-B	3/4"	VENDOR CABLE	240V	PUMP 2 FEEDER	MCP-B100	PMP-B110	TERMINATE VENDOR CABLE AT SEAL OFF. CONTINUE TO MCP-A100
P-B107	E-601-B, E-101-B	3/4"	VENDOR CABLE	240V	PUMP 2 FEEDER	MCP-B100	PMP-B100	TERMINATE VENDOR CABLE AT SEAL OFF. CONTINUE TO MCP-A100
P-B108	E-101-B	3/4"	(2) #12, #12 GND	120V	LOCAL CONTROL PANEL	LCP-B100	LCP-B100	
P-B109	E-101-B	3/4"	(2) #12, #12 GND	120V	SITE RECEPTACLE	LVP-B100	SITE RECEPTACLE	
P-B110	E-101-B	3/4"	(2) #12, #12 GND	120V	SITE LIGHT	LVP-B100	SITE LIGHT	
P-B111	E-101-B	3/4"	(2) #12, #12 GND	120V	GENERATOR BATTERY CHARGER	LVP-B100	GEN-B100	
P-B112	E-101-B	3/4"	(3) #12, #12 GND	240V	GENERATOR BLOCK HEATER	LVP-B100	GEN-B100	

***NOTE:** **CONDUIT SPECIFICATION IS INDICATIVE OF THE TYPE OF INSTALLATION REQUIRED FOR MAJORITY OF CABLE ROUTING. EC IS RESPONSIBLE FOR ALL WIRING METHODS AND MATERIALS INCLUDING CONDUIT TRANSITIONS, SUPPORTS, PENETRATIONS, ETC., AS REQUIRED FOR A COMPLETE INSTALLATION AND MEETING ALL REQUIREMENTS OF ARTICLE 300 OF THE NATIONAL ELECTRIC CODE.**



A1 ONE-LINE DIAGRAM
N.T.S.

PANEL NAME: LVP-B100

LOCATION: PANEL RACK
FED FROM: ATS-B100
MOUNTING: RACK
VOLTAGE: 240D/120
PHASE & WIRE: 3PH 4W
AIC RATING: 10K
ENCLOSURE: N3R
BUS: 125A
FEED: BOTTOM
MAIN BREAKER: 100A
SPACES: 18
NOTES:

NOTES	CIRCUIT DESCRIPTION	CODE	LOAD	POLE	BKR	CKT	PH	CKT	BKR	POLE	LOAD	CODE	CIRCUIT DESCRIPTION	NOTES
	PMP-B100		3450	3	60	1	A	2	60	3	3450		PMP-B110	
			3450			3	B	4			3450			
			3450			5	C	6			3450			
	LCP-B100		500	1	20	7	A	8	20	1	180		SITE RECEPTACLE	
						9	B	10						
	SITE LIGHT		51	1	20	11	C	12	20	1	1200		GENERATOR BATTERY CHARGER	
						13	A	14	20	1	750		GENERATOR BLOCK HEATER	
						15	B	16			750			
						17	C	18						

CONNECTED VA PHASE A:	8330	% CONNECTED VA PHASE A:	35%
CONNECTED VA PHASE B:	7650	% CONNECTED VA PHASE B:	32%
CONNECTED VA PHASE C:	8151	% CONNECTED VA PHASE C:	34%
TOTAL VA:	24131		
CONNECTED AMPS:	58		
DIVERSITY: 1.00	DIVERSIFIED AMPS: 58		

GENERAL SHEET NOTES

1. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
2. COORDINATE WORK AND ROUGH-IN LOCATIONS WITH RELATED TRADES.
3. ROUTE CONDUIT IN COMMON TRENCH WHENEVER POSSIBLE.
4. CONTRACTOR SHALL PROVIDE & CHECK CIRCUIT BREAKER POSITIONS.
5. CONTRACTOR SHALL PROVIDE NEW UPDATED DIRECTORIES FOR ALL PANELS IN WHICH CIRCUITS ARE ADDED OR REMOVED. DELETED CIRCUITS SHALL BE MARKED SPARE.
6. ALL ELECTRICAL EQUIPMENT SHALL BE FIELD MARKED PER THE NEC 110.16 "POTENTIAL ELECTRIC ARC FLASH HAZARD".
7. PROVIDE BREAKERS WITH LOCK OUT TAG OUT PROVISIONS.

SHEET KEYNOTES

01 PROVIDE SEAL OFFS AT BASE OF EQUIPMENT RACK. FOR CLASSIFICATION DRAWING RE: E-125-B.

02 COORDINATE WITH AVISTA UTILITIES FOR NEW INCOMING SERVICE.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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AVISTA UTILITIES
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8/7/2024
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BRADLEY M. CULVER

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LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - ONE-LINE DIAGRAM

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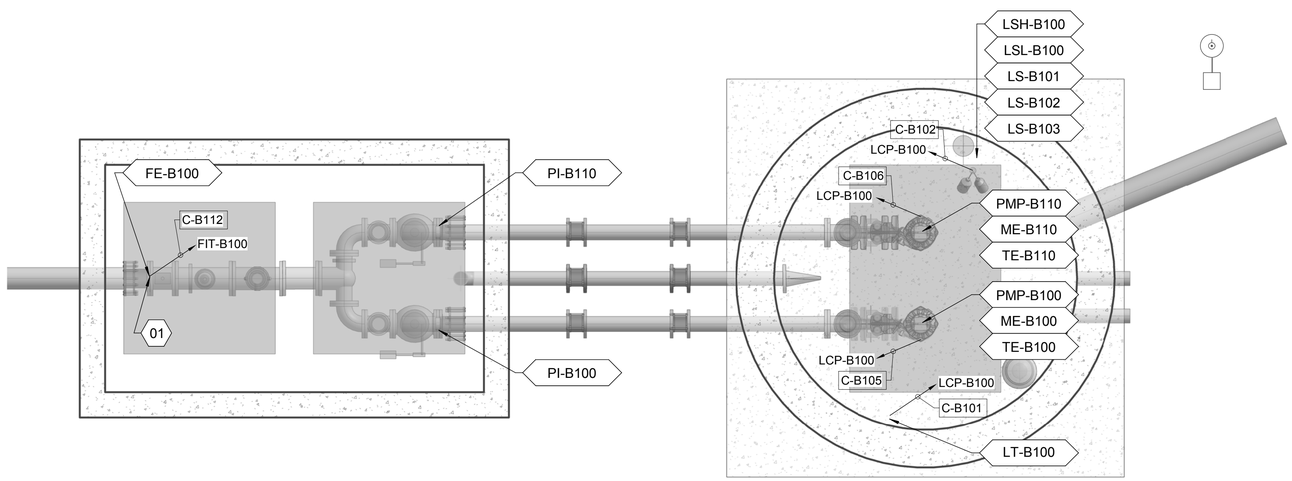
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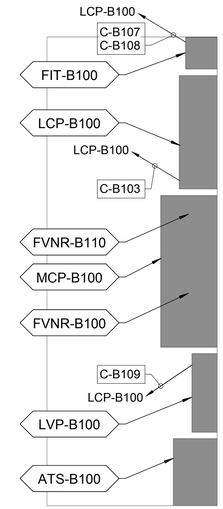
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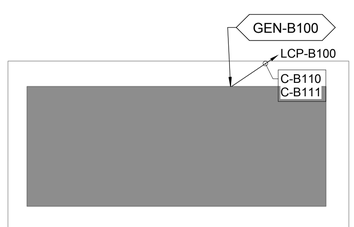
CONTROL CABLE AND CONDUIT SCHEDULE

CONDUIT TAG	REF. SHEET	*CONDUIT SPEC	CABLE SPEC	SERVICE	DESCRIPTION	ORIGIN	DESTINATION	NOTES
C-B101	EI-101-B	3/4"	1PR #18 TWOS	ANALOG	SUBMERSIBLE LEVEL TRANSMITTER SIGNALS	LCP-B100	LT-B100	PROVIDE SEAL-OFF AT LCP-B100
C-B102	EI-101-B	3/4"	(5) 2/C #16	DISCRETE	WET WELL LEVEL SWITCH SIGNALS	LCP-B100	LSH-B100, LSL-B100, LS-B101, LS-B102, LS-B103	PROVIDE SEAL-OFF AT LCP-B100
C-B103	EI-101-B	1"	(2) CAT6	ETHERNET	FVNR SIGNALS	LCP-B100	MCP-B100	
C-B104								
C-B105	EI-101-B	3/4"	BY MANUFACTURER	DISCRETE	PMP-B100 SEAL LEAK RELAY SIGNALS	MCP-B100	PMP-B100	PROVIDE SEAL-OFF AT MCP-B100
C-B106	EI-101-B	3/4"	BY MANUFACTURER	DISCRETE	PMP-B110 SEAL LEAK RELAY SIGNALS	MCP-B100	PMP-B110	PROVIDE SEAL-OFF AT MCP-B100
C-B107	EI-101-B	3/4"	1PR #18 TWOS, 2/C #16	ANALOG/DISCRETE	FLOW METER SIGNALS	LCP-B100	FIT-B100	
C-B108	EI-101-B	3/4"	(2) #14, #14 GND	POWER	FLOW METER POWER	LCP-B100	FIT-B100	
C-B109	EI-101-B	3/4"	(3) 2/C #16	DISCRETE	ATS SIGNALS	LCP-B100	ATS-B100	
C-B110	EI-101-B	3/4"	1PR #18 TWOS, (3) 2/C #16	ANALOG/DISCRETE	GENERATOR SIGNALS	LCP-B100	GEN-B100	
C-B111	EI-101-B	3/4"	(3) 2/C #16	DISCRETE	ATS TO GENERATOR SIGNALS	ATS-B100	GEN-B100	
C-B112	EI-101-B	3/4"	BY MANUFACTURER	ANALOG	FLOW ELEMENT SIGNALS	FE-B100	FIT-B100	COORDINATE WITH MANUFACTURER FOR CABLE LENGTH. PROVIDE SEAL-OFF

***NOTE:** **CONDUIT SPECIFICATION IS INDICATIVE OF THE TYPE OF INSTALLATION REQUIRED FOR THE MAJORITY OF THE CABLE ROUTING. EC IS RESPONSIBLE FOR ALL WIRING METHODS AND MATERIALS INCLUDING CONDUIT TRANSITIONS, SUPPORTS, PENETRATIONS, ETC., AS REQUIRED FOR A COMPLETE INSTALLATION AND MEETING ALL REQUIREMENTS OF ARTICLE 300 OF THE NATIONAL ELECTRIC CODE.**
EC MAY COMBINE LOW VOLTAGE SIGNAL CABLES IN SAME CONDUITS AND RACEWAYS WHERE APPROPRIATE FOR ROUTING AND MAY INCREASE CONDUIT SIZE AS NEEDED FOR GROUPED CABLES. INSTRUMENT, SIGNAL, AND NETWORK CABLES ARE TO BE SEPARATED FROM POWER CONDUCTORS.
CABLE VOLTAGE > 50V SHALL BE ROUTED IN A SEPARATE RACEWAY OR SEGREGATED VIA PHYSICAL BARRIER SEPARATION AND/OR MINIMUM DISTANCE OF 12 IN. FROM SIGNAL CABLES, MAINTAINED FOR ENTIRE LENGTH OF CABLE RUN.







A1 INSTRUMENTATION PLAN
1/2" = 1'-0"

1/2" 0 1' 2' 4'

GENERAL SHEET NOTES

1. CONTRACTOR TO PROVIDE ALL EQUIPMENT AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION.
2. COORDINATE WORK AND ROUGH-IN LOCATIONS WITH RELATED TRADES.
3. CONCEAL ALL RACEWAYS WITHIN FINISHED WALLS, CEILINGS, AND FLOORS, UNLESS OTHERWISE INDICATED.
4. ROUTE CONDUIT IN COMMON TRENCH WHENEVER POSSIBLE.
5. COORDINATE WITH SCADA INTEGRATOR.
6. RE: EI-601-B FOR CONDUIT SCHEDULE.
7. COORDINATE FINAL CABLE SPECIFICATIONS AND TERMINATIONS TO EQUIPMENT WITH MANUFACTURER PROVIDED.
8. RE: G-006 FOR EQUIPMENT RESPONSIBILITY MATRIX.

SHEET KEYNOTES

01 CONTRACTOR TO COORDINATE WITH MANUFACTURER FOR LENGHT OF VENDOR CABLE FROM FLOW ELEMENT TO FLOW INDICATING TRANSMITTER.

EQUIPMENT KEYNOTES

ATS-B100	AUTOMATIC TRANSFER SWITCH
FE-B100	6" FLOW METER, RE: SPEC
FIT-B100	FLOW INDICATING TRANSMITTER
FVNR-B100	PUMP #1 MOTOR STARTER
FVNR-B110	PUMP #2 MOTOR STARTER
GEN-B100	NATURAL GAS GENERATOR
LCP-B100	LOCAL CONTROL PANEL
LS-B101	LEVEL FLOAT, RE: STD DTL M297
LS-B102	LEVEL FLOAT, RE: STD DTL M297
LS-B103	LEVEL FLOAT, RE: STD DTL M297
LSH-B100	LEVEL FLOAT, RE: STD DTL M297
LSL-B100	LEVEL FLOAT, RE: STD DTL M297
LT-B100	LEVEL TRANSMITTER, RE: STD DTL M901
LVP-B100	POWER PANEL
MCP-B100	MOTOR CONTROL PANEL
ME-B100	MOISTURE ELEMENT
ME-B110	MOISTURE ELEMENT
PI-B100	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PI-B110	PRESSURE GAUGE WITH ANNULAR SEAL, RE: STD DTL M321
PMP-B100	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00
PMP-B110	SUBMERSIBLE NON-CLOG PUMP, RE: SPEC 43 20 00
TE-B100	TEMPERATURE ELEMENT
TE-B110	TEMPERATURE ELEMENT

KELLER ASSOCIATES
601 East Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

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LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - INSTRUMENTATION PLAN

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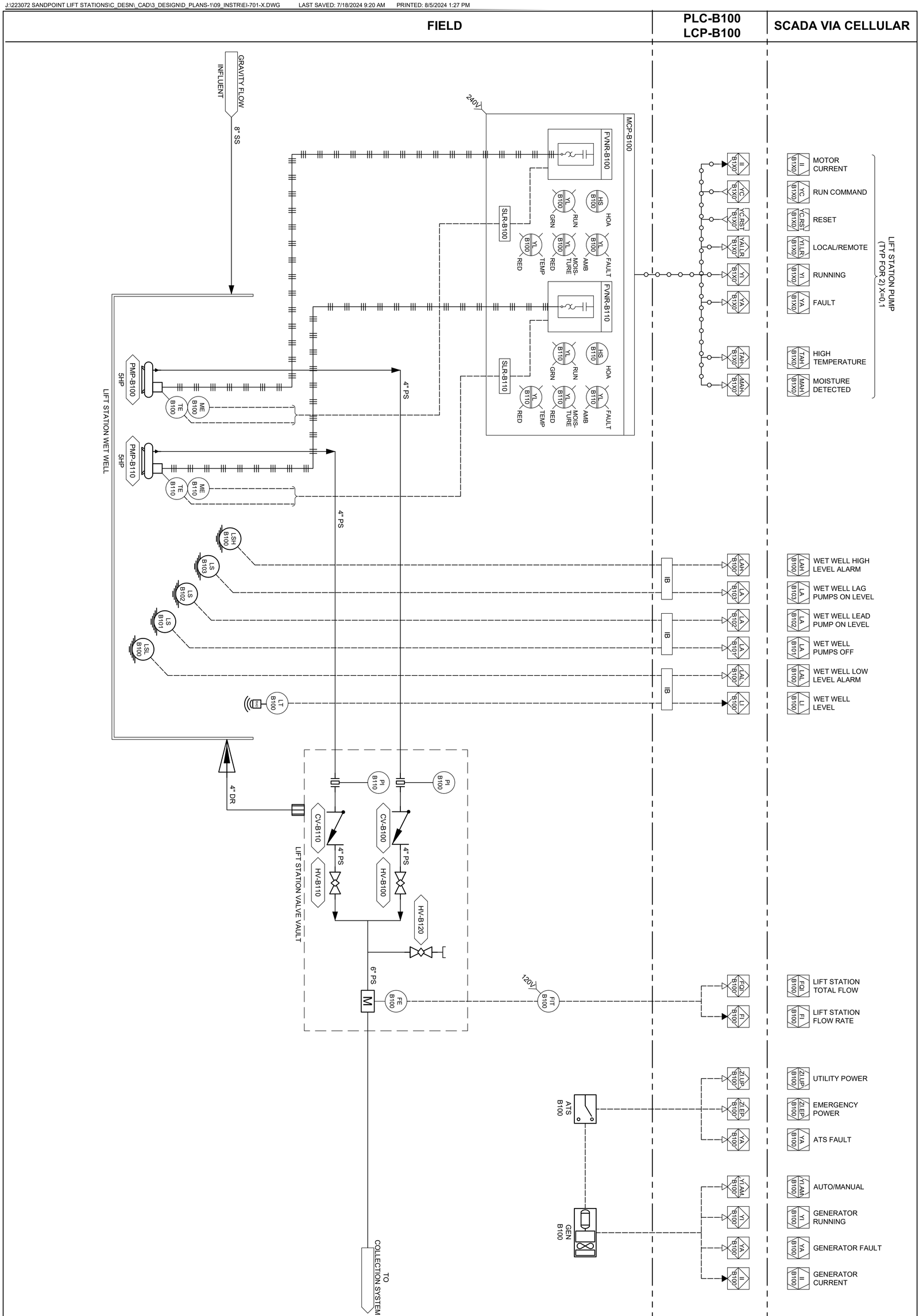
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LIFT STATION REPLACEMENTS

SUPERIOR STREET LIFT STATION - P&ID

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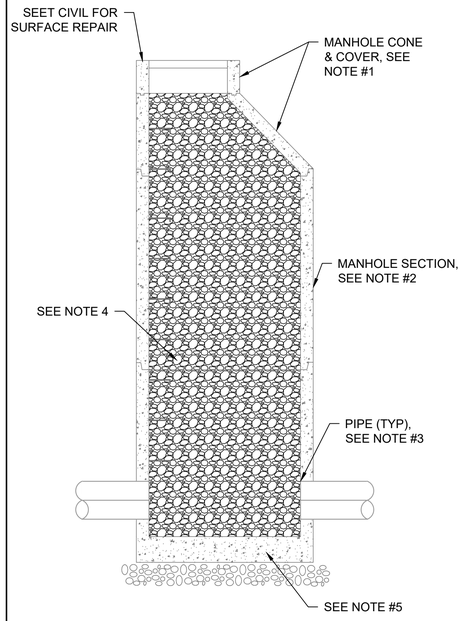
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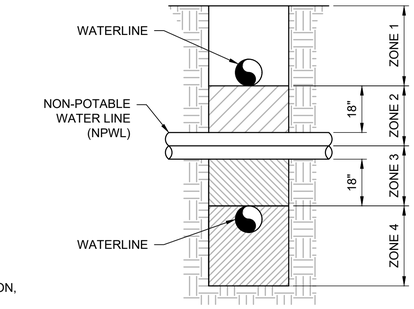


NOTES:

1. REMOVE MANHOLE CONE & COVER.
2. ABANDON MANHOLE SECTION(S), REMOVE ONLY IF INCIDENTAL TO NEW CONSTRUCTION AND OR WITHIN 24" OF FINISH GRADE.
3. PLUG ALL PIPES, FILL ENTIRE ANNULAR SPACE WITH GROUT TO MINIMUM OF 12-INCH LENGTH.
4. FILL REMAINING MANHOLE SECTION(S) WITH AGGREGATE BASE OR LEAN CONCRETE FILL TO ROADWAY SECTION.
5. CONTRACTOR TO BREAK OUT BOTTOM OF MANHOLE.

C8000 MANHOLE ABANDONMENT

N.T.S.



VERTICAL SEPARATION REQUIREMENTS

ZONE 1: A) WATER AND NPWL MUST BE SEPERATED BY AT LEAST 18" AND B) ONE FULL, UNCUT LENGTH OF BOTH PWL AND NPWL PIPE MUST BE CENTERED ON THE CROSSING SO THAT THE JOINTS ARE AS FAR AS POSSIBLE FROM THE CROSSING.

ZONE 2: A) ONE FULL, UNCUT LENGTH OF BOTH PWL AND NPWL PIPE MUST BE CENTERED ON THE CROSSING SO THAT THE JOINTS ARE AS FAR AS POSSIBLE FROM THE CROSSING.

AND EITHER B) NPWL MUST BE CONSTRUCTED TO WATER MAIN STANDARDS AND PRESSURE TESTED FOR WATER TIGHTNESS FOR A HORIZONTAL DISTANCE OF 10 FEET ON BOTH SIDES OF THE CROSSING.

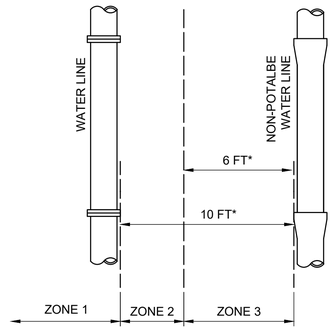
OR C) EITHER THE NPWL OR WATER LINE OR BOTH MUST BE ENCASED WITH A SLEEVEING MATERIAL ACCEPTABLE TO DEQ FOR A HORIZONTAL DISTANCE OF 10 FEET ON BOTH SIDES OF THE CROSSING.

ZONE 3: SAME REQUIREMENTS AS ZONE 2 EXCEPT THE NPWL MUST ALSO BE SUPPORTED ABOVE THE CROSSING TO PREVENT SETTLING.

ZONE 4: SAME REQUIREMENTS AS ZONE 1 EXCEPT THE NPWL MUST ALSO BE SUPPORTED ABOVE THE CROSSING TO PREVENT SETTLING.

C3001 POTABLE / NON-POTABLE WATER CROSSING

N.T.S.



HORIZONTAL SEPARATION REQUIREMENTS

ZONE 1: A) NO SPECIAL REQUIREMENTS.

ZONE 2: A) NO SPECIAL REQUIREMENTS FOR POTABLE OR NON-POTABLE SERVICES.

B) WATER AND NPWL SEPARATED BY AT LEAST 6 FEET AT OUTSIDE WALLS.

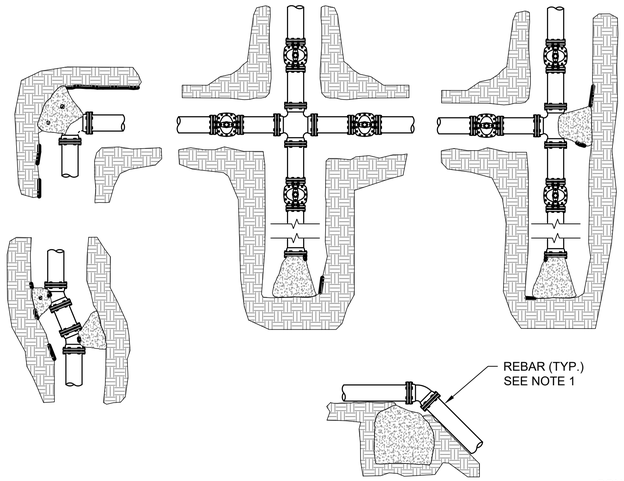
AND C) WATER AT LEAST 18 INCHES HIGHER IN ELEVATION THAN THE NPWL.

AND EITHER D) NPWL CONSTRUCTED TO WATER MAIN STANDARDS AND PRESSURE TESTED FOR WATER TIGHTNESS.

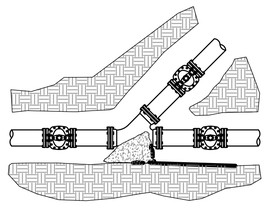
OR E) SITE SPECIFIC REQUIREMENTS APPROVED BY DEQ.

ZONE 3: NOT ALLOWED WITHOUT DEQ WAIVER.

NOTE: SANITARY SEWER FORCE MAINS MUST HAVE MIN. 10' HORIZONTAL SEPARATION AND 18" VERTICAL SEPARATION. ZONE 2 AND ZONE 3 PLACEMENTS ARE NOT ALLOWED WITHOUT A WAIVER GRANTED BY DEQ.



VERTICAL BEND



NOTES

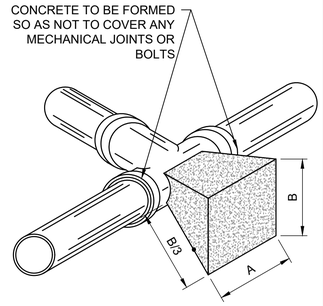
1. #4 REBAR REQ'D. AS SHOWN. REBAR SHALL RECEIVE A BITUMINOUS COAL TAR BASE COATING.
2. CONCRETE BLOCKING MUST CURE 24 HOURS BEFORE CHARGING SYSTEM

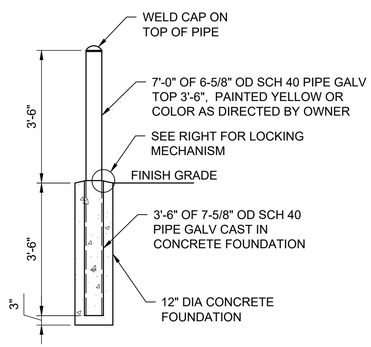
NOTE: THIS TABLE IS BASED ON 150 PSI MAIN PRESSURE
200 PSF SOIL BEARING PRESSURE.

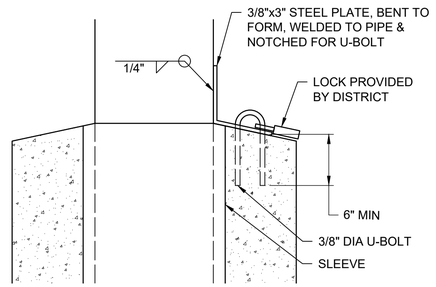
DIMENSION FOR THRUST BLOCKING								
FITTING SIZES	TEES & PLUGS		90° BEND		45° BEND & WYES		REDUCERS & 22½° BEND	
	A	B	A	B	A	B	A	B
4"	1'-7"	1'-2"	1'-9"	1'-6"	1'-8"	0'-10"	1'-7"	0'-6"
6"	2'-0"	1'-11"	2'-5"	2'-2"	1'-10"	1'-7"	1'-9"	0'-10"
8"	2'-8"	2'-6"	3'-2"	3'-0"	2'-5"	2'-1"	1'-9"	1'-6"
10"	3'-4"	3'-3"	4'-0"	3'-10"	3'-0"	2'-9"	2'-2"	1'-11"
12"	4'-0"	3'-10"	4'-8"	4'-8"	3'-8"	3'-3"	2'-7"	2'-3"
14"	5'-5"	3'-10"	6'-6"	4'-11"	4'-9"	3'-5"	3'-5"	2'-5"

C7204 TYPICAL THRUST BLOCK INSTALLATION

N.T.S.





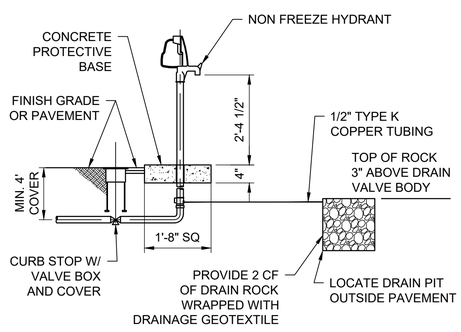


LOCKING MECHANISM
N.T.S.

C0121 BOLLARD REMOVABLE

1/2" = 1'-0"

0 1' 2' 4'

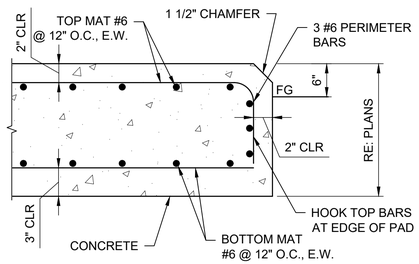


NOTES:

1. WOODFORD IOWA YARD HYDRANT MODEL Y1 OR EQUAL.
2. IF SUPPLY LINE WILL NOT SUPPORT HYDRANT, INSTALL 4x4 STEEL POST OR SIMILAR TO VERTICAL EXTENT OF SUPPLY LINE, TO SUPPORT HYDRANT.

C7504 NON-FREEZE YARD HYDRANT

N.T.S.



NOTES:

1. BROOM FINISH CONCRETE, CONTINUOUS PLACEMENT PREFERRED, SCORE INTERVALS AT 5-FEET MAXIMUM SPACING.
2. SEE SPECIFICATIONS FOR MATERIALS, PLACEMENT & CONSTRUCTION REQUIREMENTS.
3. REINFORCE AS SHOWN, UNLESS OTHERWISE NOTED IN PLANS.

C1421 EQUIPMENT PAD

N.T.S.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED Kyle Meschko 17127 8/6/2024 STATE OF IDAHO KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

STANDARD DETAILS

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VERIFY SCALE: Scales based on 22"x34" prints.

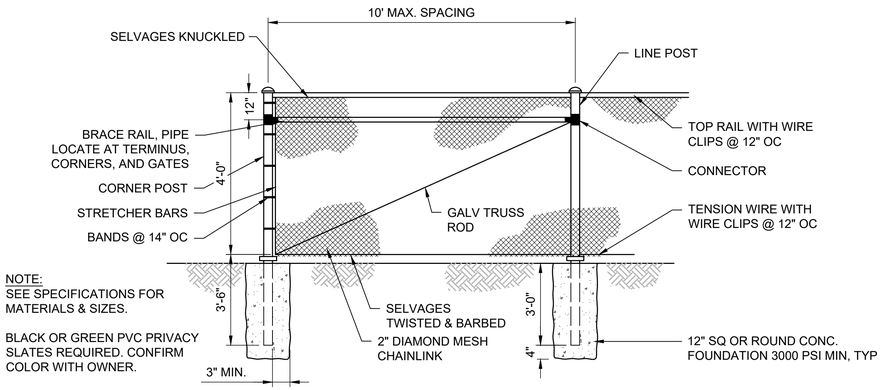
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PROJECT NO. 223072 PAGE

SHEET NO. C-501

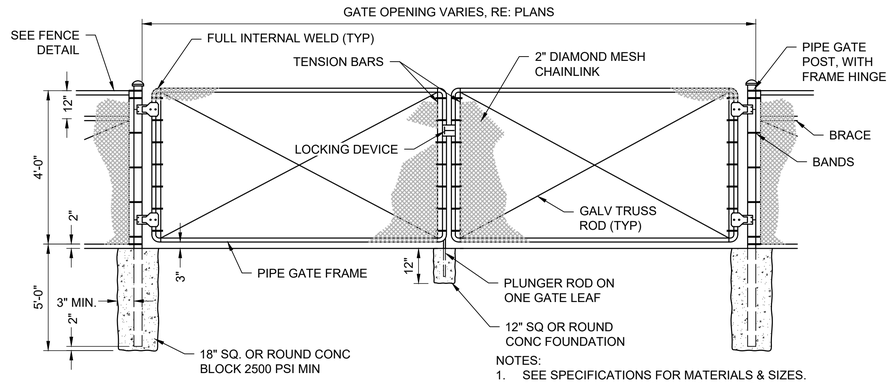
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C0221 FENCE - CHAIN LINK

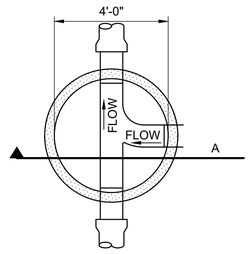
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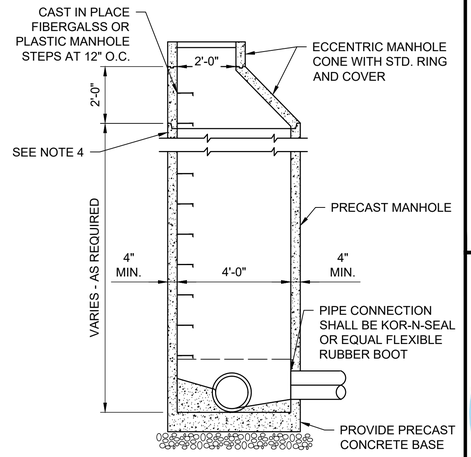
NOTES:
1. SEE SPECIFICATIONS FOR MATERIALS & SIZES.
2. SEE FENCE DETAIL FOR BRACING AT GATE.
3. BLACK OR GREEN PVC PRIVACY SLATES REQUIRED. CONFIRM COLOR WITH OWNER.

C0323 GATE - CHAIN LINK DOUBLE SWING

N.T.S.



PLAN VIEW

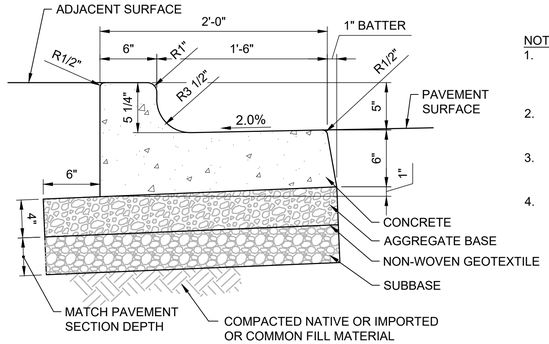


SECTION A

NOTES:
1. PROVIDE PIPE JOINTS WITHIN 2'-0" OF MANHOLE WALL AT EACH PIPE.
2. MANHOLES LOCATED IN UNIMPROVED, NO TRAFFIC AREAS. PLACE COVER APPROXIMATELY 6" ABOVE GROUND SURFACE.
3. CONCRETE CHANNELS WITH MIN. 2" SLOPE TROWEL SMOOTH.
4. MAJESTIC JOINT SEAL WITH BUTYL COMPOUND PLASTIC WRAP (TYP) NO EXCEPTIONS. MANHOLES SHALL BE WATERTIGHT.

C6002 STANDARD MANHOLE - TYPE A

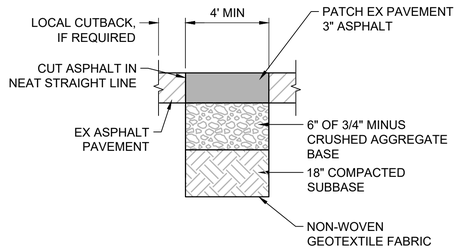
3/8" = 1'-0"



NOTES:
1. PLACE EXPANSION JOINT MATERIAL AT TERMINAL POINTS OF RADII, ADJACENT TO STRUCTURES AND 60-FEET MAXIMUM SPACING.
2. CONTINUOUS PLACEMENT PREFERRED, SCORE INTERVALS 8-FEET MAXIMUM SPACING.
3. SEE SPECIFICATIONS FOR MATERIALS, PLACEMENT & COMPACTION REQUIREMENTS.
4. ADJACENT WALKING SURFACES TO BE FLUSH WITH TOP OF CURB. ADJACENT LAWN OR LANDSCAPE SURFACES TO BE 1-INCH BELOW TOP OF CURB.

C1201 STANDARD CURB & GUTTER

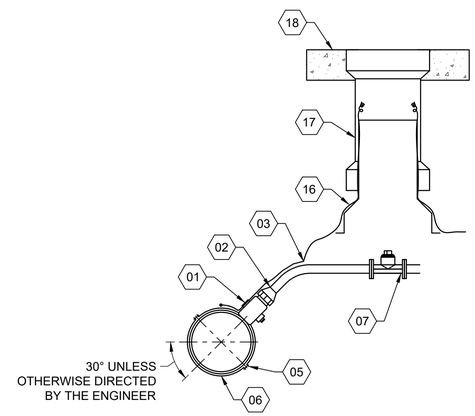
1-1/2" = 1'-0"



NOTES:
1. SEE SPECIFICATIONS FOR MATERIALS AND CONSTRUCTION REQUIREMENT.
2. KEEP TRAFFIC OFF 72 HOURS, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. ALL STREET CUTS WILL REQUIRE RESURFACING BY A PAVING MACHINE OR SPREADER BOX. PATCH WIDTHS ARE NEVER TO BE LESS THAN 4'. LOCATE THE MATCH OF THE NEW TO EXISTING PAVEMENT OUT OF THE VEHICLE WHEEL PATH OF THE STREET.
4. TACK ALL COLD JOINT SURFACES WITH EMUSION WHICH HAS BEEN BROKEN PRIOR TO PATCHING.

C3032 SURFACE REPAIR - ASPHALT

N.T.S.

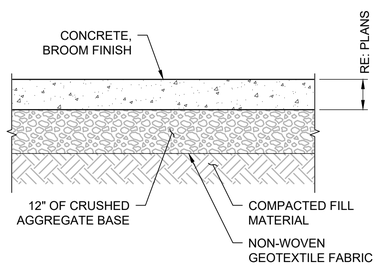


KEYNOTES

01 FORD FB-1101 OR MUELLER BALL CORP STOP 34" OR 1"
02 MUELLER H-15072
03 NO 12 COPPER FINDER WIRE
04 20" DIAX42" DEEP METER BOX (NOTCH FOR SERVICE LINES)
05 STAINLESS STEEL SADDLE
06 WATER MAIN
07 FORD BALL VALVE CURB STOP W/ VALVE RISER AND LOCKING LID. (IF REQUIRED)
1-1/2" = B11-666
2" = B11-777
16 4" DIA. SEWER PIPE. NOTCH BOTTOM TO FIT OVER CURB STOP
17 VALVE BOX
18 CONCRETE COLLAR

A4 NEW WATER SERVICE LINE

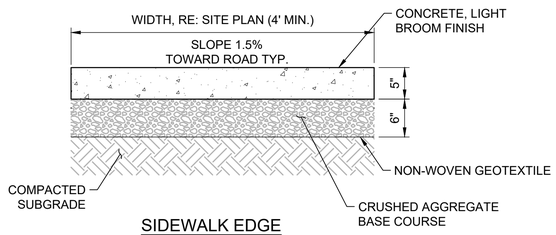
1" = 1'-0"



NOTES:
1. PLACE EXPANSION JOINT MATERIAL ADJACENT TO STRUCTURES AND 60' MAXIMUM SPACING.
2. BROOM FINISH CONCRETE, CONTINUOUS PLACEMENT PREFERRED, SCORE INTERVALS AT 5-FEET MAXIMUM SPACING.
3. SEE SPECIFICATIONS FOR MATERIALS, PLACEMENT & CONSTRUCTION REQUIREMENTS.

C1422 CONCRETE PAD

N.T.S.

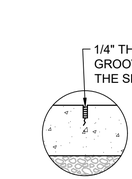


SIDEWALK EDGE

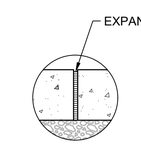
NOTES:
1. PLACE EXPANSION JOINT ADJACENT TO STRUCTURES AND 60 FEET MAXIMUM SPACING.
2. CONTINUOUS PLACEMENT PREFERRED, CONTROL JOINT INTERVALS AT 5 FEET MAXIMUM SPACING.
3. SEE SPECIFICATIONS FOR MATERIALS, PLACEMENT & CONSTRUCTION REQUIREMENTS.
4. PREPARE SUBGRADE IN ACCORDANCE WITH SPECIFICATIONS.
5. EXPANSION JOINT 1/2" PREFORMED JOINT MATERIAL (AASHTO M 213). FILL WITH JOINT SEALER TO 1/4" BELOW SURFACE.

C1401 CONCRETE SIDEWALK

N.T.S.



CONTROL JOINT



EXPANSION JOINT

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

STANDARD DETAILS

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VERIFY SCALE: Scales based on 22"x34" prints.

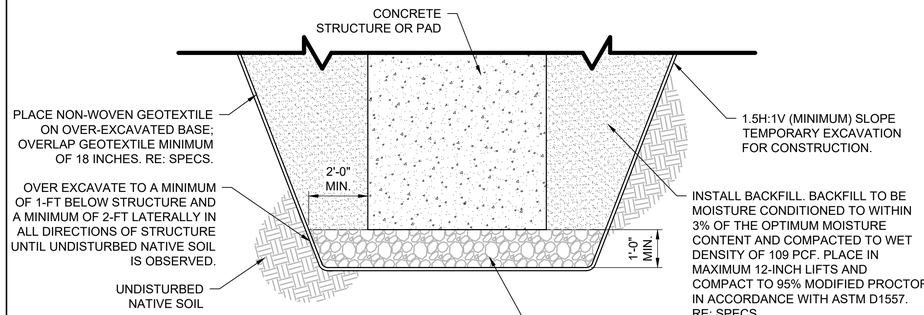
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PROJECT NO. 223072 PAGE

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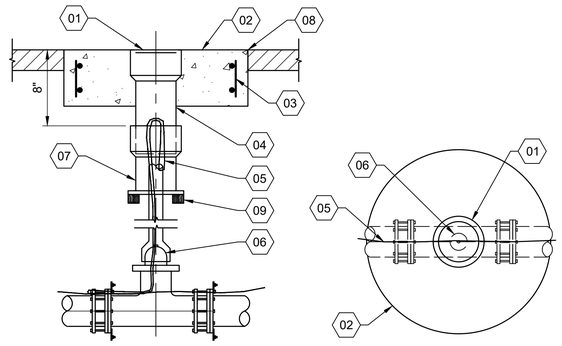
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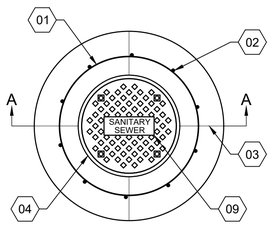
NOTES:
1. APPLICABLE FOR WET WELLS, VALVE VAULTS, MANHOLES, GENERATOR PADS, AND CONTROL PANEL PADS.
2. ALL WORK TO COMPLY WITH GEOTECHNICAL ENGINEERING EVALUATION. GROUNDWATER MAY BE ENCOUNTERED AT GROUND SURFACE.

C1 TYPICAL EXCAVATION SECTION
1/2" = 1'-0"

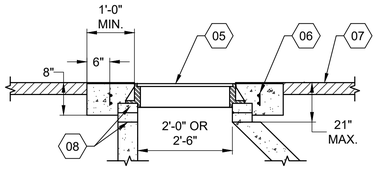


-- KEYNOYES
01 5 1/4" LID
02 24"Ø x 6" CONCRETE COLLAR
03 (2) #4 REBAR HOOPS WITH #4 VERTICALS
04 PACK VOID WITH RUBBER SILICONE
05 NO. 12 AWG. COPPER WIRE FINDER
06 VALVE
07 CAST IRON VALVE RISER
08 FINISHED GRADE
09 REDWOOD BLOCKS

C7001 VALVE BOX & LID
N.T.S.



PLAN VIEW

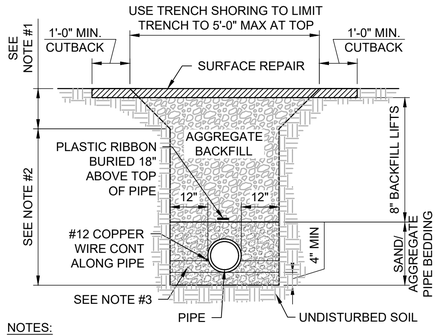


SECTION A-A

-- LEGEND
01 #4 REBAR HOOPS (2 EACH) SEE SECTION A-A.
02 #4 REBAR AT 20" SPACING.
03 SCORES.
04 RIM.
05 FRAME & COVER.
06 SEE PLAN VIEW FOR REBAR IN COLLAR.
07 FINISHED GRADE.
08 GASKET OR MASTIC SEALER BETWEEN RING & COVER & GRADE RINGS.
09 UTILITY DESCRIPTION (SANITARY SEWER, POTABLE WATER, STORM DRAINAGE).

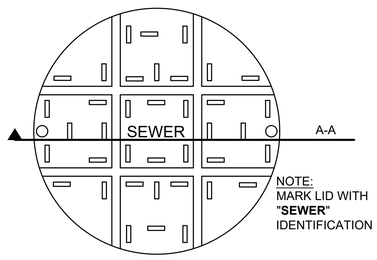
NOTES:
1. TOP OF COLLAR TO BE FLUSH WITH MANHOLE COVER.
2. 4000 PSI CONCRETE TO BE USED.

C6031 MANHOLE COLLAR
1/2" = 1'-0"



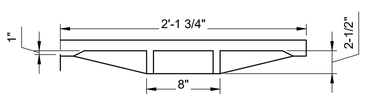
NOTES:
1. BACKSLOPE TRENCH WALLS TO PROVIDE STABLE SLOPE CONDITIONS PER OSHA REQUIREMENTS.
2. SHORE TRENCH WALLS TO MAINTAIN STABILITY OF EXCAVATION COMPLY WITH OSHA FOR SHORING.
3. HAND COMPACT UNDER HAUNCHES OF PIPE, BRING UP BACKFILL EVENLY AT EACH SIDE.

C3011 PIPE INSTALLATION
1/2" = 1'-0"



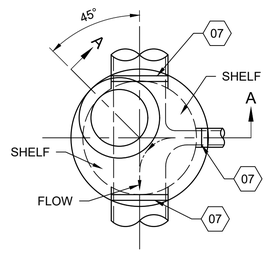
NOTE:
MARK LID WITH "**SEWER**" IDENTIFICATION

PLAN VIEW

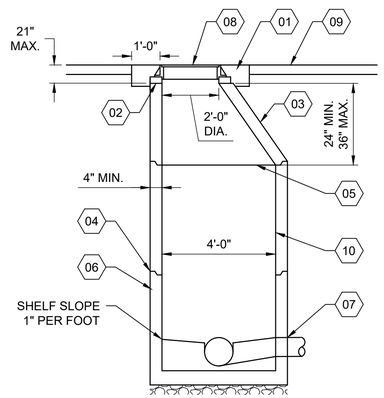


SECTION A-A

C6032 STANDARD SEWER COVER
N.T.S.



PLAN VIEW

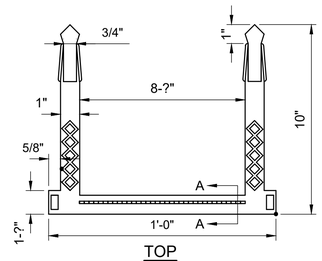


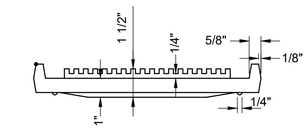
SECTION A-A

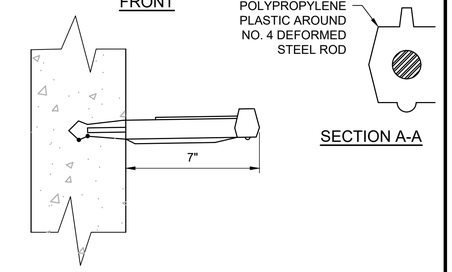
C6003 STANDARD MANHOLE - TYPE A
3/8" = 1'-0"

-- LEGEND
01 CONCRETE COLLAR IN PAVED AREAS
02 GRADE RINGS GROUTED WATERTIGHT IN PLACE, NOT TO EXCEED 12" FROM FINISHED SURFACE TO TOP OF CONE
03 PRECAST MONOLITHIC ECCENTRIC CONE SECTION. (REBAR NOT SHOWN)
04 MANHOLE JOINT
05 PROPERLY ALIGN ALL INTERIOR JOINTS
06 PRECAST CONCRETE MANHOLE-BARREL SECTION & BASE
07 PIPE PENETRATION, RE: STANDARD DETAIL M253
08 FRAME & COVER
09 FINISH GRADE
10 LINER, RE: SPECIFICATIONS

NOTES:
1. PLACE VERTICAL WALL ON UPSTREAM SIDE OF MANHOLE, ROTATED 45 DEGREES.
2. PROVIDE MANHOLE CONCRETE REINFORCING TO ACCOMMODATE TRAFFIC LOADINGS.







NOTES:
1 PLACE INTO WET CONCRETE WALL DURING MANUFACTURER OR MORTAR INTO HOLES AFTER CONCRETE HAS SET.
2 PLASTIC COATED STEPS AS PER THIS STANDARD DRAWING OR AS APPROVED BY THE ENGINEER.

C6028 MANHOLE STEPS
3" = 1'-0"

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED Kyle Meschko 17127 8/6/2024 STATE OF IDAHO KYLE MESCHKO

NO.	REVISIONS	DATE

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SANDPOINT

LIFT STATION REPLACEMENTS

STANDARD DETAILS

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VERIFY SCALE: Scales based on 22"x34" prints.
1-1/2 Inches

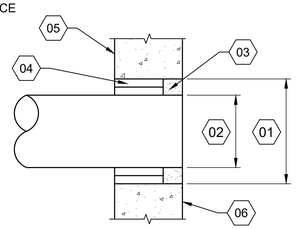
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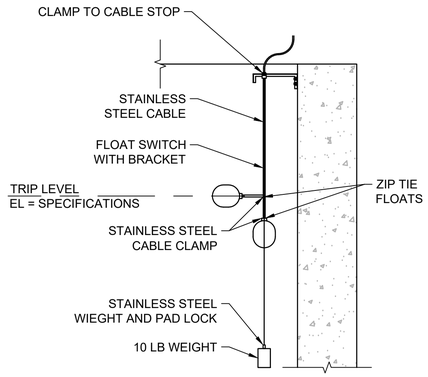
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SHEET KEYNOTES

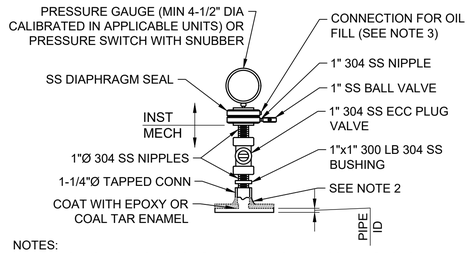
01 CAST OR CORE DRILL HOLE INTO WALL OR MANHOLE. COORDINATE OPENING DIAMETER WITH LINK SEAL REQUIREMENTS.
02 PIPE DIAMETER VARIES
03 MICROSILICA FUME GROUT PACK ON
04 LINK SEAL SIZE VARIES AND IS BASED ON PIPE DIAMETER AND MANUFACTURERS RECOMMENDATION.
05 BACKFILL FACE
06 INSIDE FACE



M253 SIDE WALL SEAL
N.T.S.

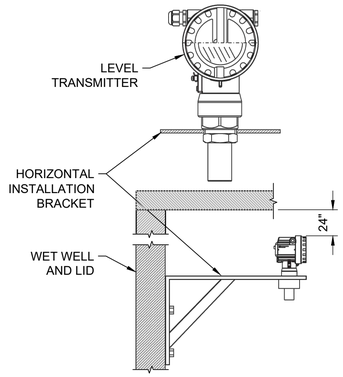


M297 FLOAT SWITCH WITH BRACKET
N.T.S.



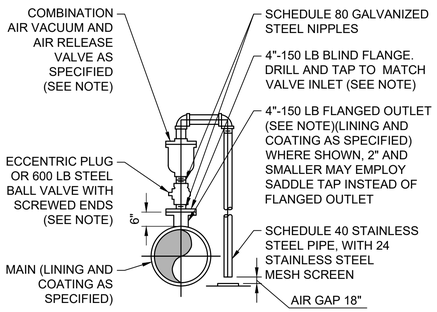
NOTES:
1. SEE SPECIFICATION SECTION 40 73 00 FOR PRESSURE GAGES, PRESSURE TRANSMITTERS, PRESSURE SWITCHES AND SEAL REQUIREMENTS.
2. FOR PRESSURE SENSING DEVICES WITH DIAPHRAGM SEALS, USE SERVICE SADDLE FOR DUCTILE IRON AND PVC PIPE. DIRECT TAPPING IS NOT ACCEPTABLE.
3. USE ANNULAR SEAL WHERE INDICATED ON THE DRAWINGS OR IN THE SPECIFICATIONS. MOUNT PRESSURE SENSING DEVICE IN SIMILAR CONFIGURATION SHOWN. COMPLETE ASSEMBLY SHALL BE PROVIDED BY THE MANUFACTURER IN ACCORDANCE WITH SECTION 40 73 00.

M321 PRESSURE GAUGE, SWITCH OR TRANSMITTER MOUNTING
N.T.S.



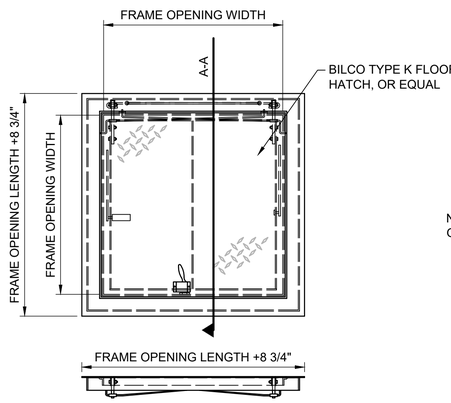
NOTES:
1. CONTRACTOR TO PURCHASE OR MANUFACTURE INSTALLATION BRACKET IN ACCORDANCE WITH MANUFACTURER REQUIREMENTS.
2. INSTALL BRACKET AND TRANSMITTER IN ACCORDANCE WITH ALL MANUFACTURER INSTRUCTIONS.
3. TRANSMITTER TO BE ACCESSIBLE FROM WET WELL ACCESS HATCH. TRANSMITTER AND BRACKET NOT TO INTERFERE WITH PUMP REMOVAL.
4. PROVIDE STAINLESS STEEL 316 COMPONENTS INSIDE WET WELL.

M901 RADAR LEVEL TRANSMITTER MOUNTING DETAIL
N.T.S.

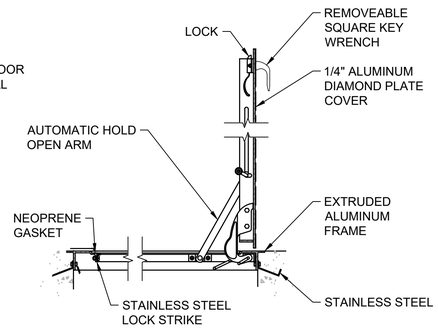


NOTES:
1. FOR MAIN PRESSURE OF MORE THAN 150 LBS, FLANGED OUTLET AND VALVES SHOULD SUIT HIGHER PRESSURE.

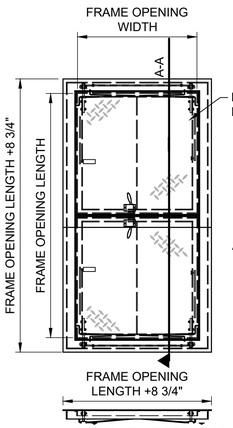
AIR VACUUM RELEASE VALVE ASSEMBLY 3" AND SMALLER
M140 3/8" = 1'-0" 0 2' 4' 6'

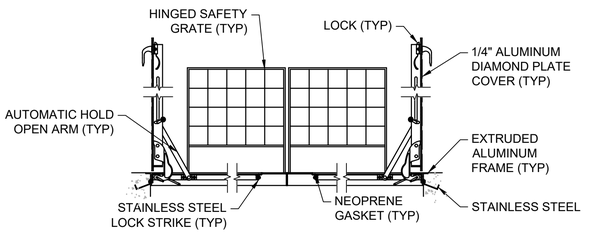


M239 SINGLE LEAF FLOOR HATCH
3/4" = 1'-0" 0 1' 2' 3'



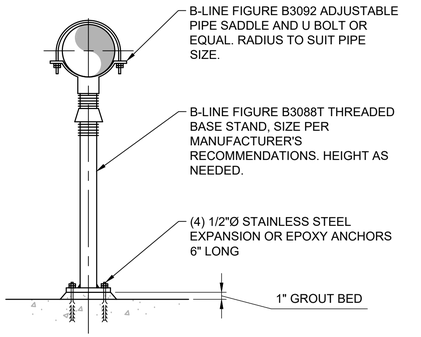
SECTION A-A



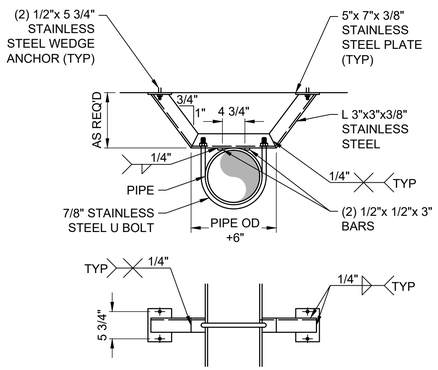


SECTION A-A

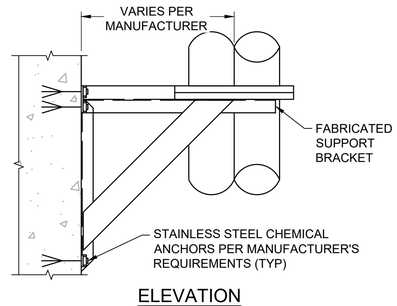
M250 DOUBLE LEAF ACCESS HATCH
1/2" = 1'-0" 0 1' 2' 4'



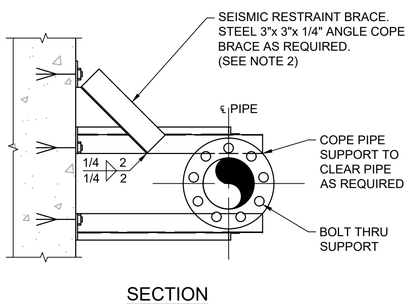
M018 PIPE SUPPORT TYPE 'T'
N.T.S.



M024 PIPE SUPPORT FOR VERTICAL PIPE
3/4" = 1'-0" 0 1' 2' 3'



ELEVATION



SECTION

NOTES:
1. FABRICATED PIPE SUPPORT IS TO BE USED FOR 4" DIAMETER AND LARGER PIPE AND WHERE NOTED ON DRAWINGS.
2. SEISMIC RESTRAINT BRACE REQUIRED AT ALL LOCATIONS, SEE SPECS.
3. WHERE SUBMERGED, ALL SUPPORT COMPONENTS SHALL BE 316 STAINLESS STEEL.
4. GALVANIZE ALL PARTS AFTER FABRICATION.

M030 FABRICATED VERTICAL PIPE SUPPORT
N.T.S.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED Kyle Meschko 17127 8/6/2024 STATE OF IDAHO KYLE MESCHKO

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SANDPOINT

LIFT STATION REPLACEMENTS

MECHANICAL STANDARD DETAILS

DRAWN: DAC CHECK: JR

VERIFY SCALE: Scales based on 22"x34" prints.
1-1/2 Inches

PROJECT NO. 223072 PAGE

SHEET NO. M-501

J:\223072 SANDPOINT LIFT STATIONS\C_DESN_CAD\3_DESIGN\D_PLANS-1\07_MECHM-501.DWG LAST SAVED: 7/17/2024 10:10 AM PRINTED: 8/5/2024 1:28 PM

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ABBREVIATIONS AND MISCELLANEOUS

AC	ABOVE COUNTER, 4" ABOVE BACK SPLASH
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
ATS	AUTOMATIC TRANSFER SWITCH
BOD	BOTTOM OF DEVICE
BLG	BELOW GRADE
C	CONDUIT
CB	CIRCUIT BREAKER
COD	CENTER OF DEVICE
EC	ELECTRICAL CONTRACTOR
GC	GENERAL CONTRACTOR
GND	GROUND
HP	HORSE POWER
MCC	MOTOR CONTROL CENTER
NEC	NATIONAL ELECTRICAL CODE
NIC	NOT IN CONTRACT
SF	SURFACE
TC	TEMPERATURE CONTROL CONTRACTOR
UG	UNDERGROUND
W/	WITH
WM	WIRE MOLD
WP	WEATHER PROOF

LIGHTING

- WALL MOUNT LIGHT FIXTURE, SIZE ON PLANS
- PENDANT OR SURFACE MOUNTED WRAP LIGHT FIXTURE, SIZE ON PLANS
- PENDANT OR SURFACE MOUNTED STRIP LIGHT FIXTURE, SIZE ON PLANS
- SHADED FIXTURE INDICATES FIXTURE SHALL BE PROVIDED WITH EMERGENCY BALLAST
- WALL MOUNTED FIXTURE
- WALL MOUNTED EXIT LIGHT
- PENDANT OR CEILING MOUNTED EXIT SIGN. SHADED AREAS INDICATE ILLUMINATED FACE, ARROWS INDICATE DIRECTION OF EGRESS.
- PHOTO CELL (PC)
- BATTERY POWERED EMERGENCY LIGHTING FIXTURE
- WALL MOUNT EXTERIOR LIGHT
- SITE LIGHTING POLE MOUNTED FIXTURE

DATA AND COMMUNICATIONS

- TELEPHONE
- DATA
- TELEPHONE & DATA
- TELEVISION CABLE
- TTB — TELEPHONE TERMINAL BOARD

WIRING LEGEND

- CONDUIT UP
- CONDUIT DOWN
- CONDUIT CONTINUATION
- CONDUIT TERMINATION / CAPPED

ONE-LINE LOADS LEGEND

- 00-XYZ-0000 — EQUIPMENT TAG
- DESC — EQUIPMENT DESCRIPTION
- X — BUILDING DESIGNATOR

POWER AND ONE-LINE

- S_X — SWITCH - SPST

"X" LEGEND

2	DOUBLE POLE	M	MOTION DETECTOR
3	3-WAY	$	MOTOR RATED
4	4-WAY	P	WITH PILOT LIGHT
D	DIMMER	OR	OVERRIDE
F	FAN	OS	OCCUPANCY SENSOR
K	KEY OPERATED	TO	THERMAL OVERLOAD

- PUSH BUTTON
- MOTORIZED DOOR CONTROLLER
- TYPE — RECEPTACLE - DUPLEX

"TYPE" LEGEND

AF	ARC FAULT	SS	SURGE SUPPRESS
GFI	GROUND FAULT	WP	WEATHER PROOF
IG	ISOLATED GRND.	WR	WEATHER RESIST.

- RECEPTACLE - QUAD
- RECEPTACLE - MULTI-OUTLET (PLUG MOLD)
- SPECIAL PURPOSE CONNECTION
- DIRECT CONNECTION
- (M) — ELECTRIC MOTOR CONNECTION
- (J) — J-BOX, 4"x4"x2" 1/8" DEEP UNLESS NOTED OTHERWISE
- (T) (T#) — THERMOSTAT BY MC, INSTALLED AND CONNECTED BY MC J-BOX AND CONDUIT TO EQUIPMENT BY E.C.
- DISCONNECT SWITCH UNFUSED
- COMBINATION STARTER
- C — CONTACTOR
- R — RELAY
- SS — SOFT START
- HF — HARMONIC FILTER
- VFD — VARIABLE FREQUENCY DRIVE
- (M) — ELECTRIC METER
- PLR — POWER LOSS RELAY
- PQM — POWER QUALITY MONITOR
- TVSS — TRANSIENT VOLTAGE SURGE SUPPRESSOR

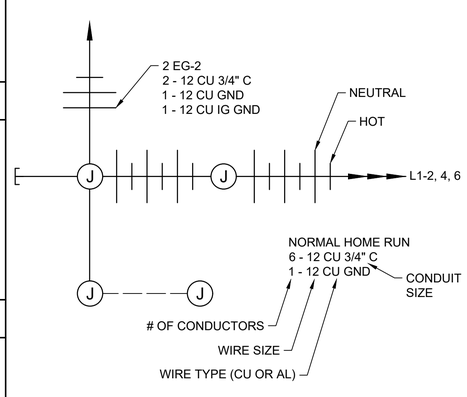
POWER AND ONE-LINE

- TRANSFORMER, DRY TYPE
- CIRCUIT BREAKER
- DRAW OUT GEAR
- MOTOR STARTER
- THERMAL OVERLOAD
- FUSE
- (X) — PUMP, X = SIZE HP
- (X) — FAN/MOTOR, X = SIZE HP
- PANEL BOARD, SURFACE MOUNTED
- PANEL BOARD, FLUSH MOUNTED

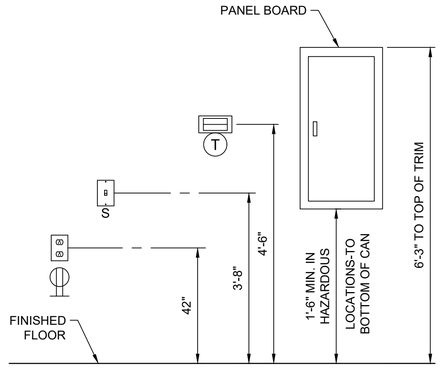
LINETYPE LEGEND

- CONDUIT CONCEALED IN WALL OR CEILING
- CONDUIT CONCEALED UNDER FLOOR OR UNDERGROUND
- DEMO EQUIPMENT
- EXISTING EQUIPMENT
- FUTURE EQUIPMENT
- NEW EQUIPMENT
- MODIFIED EQUIPMENT
- UGP — UNDERGROUND POWER - FROM PROVIDER
- E — UNDERGROUND POWER
- FO — FIBER OPTIC
- JT — JOINT TRENCH

CIRCUITING SYMBOLS



E001 TYP — LEGENDS AND SCHEDULES — N.T.S.



E002 TYP — MOUNTING HEIGHT DETAIL — N.T.S.

GENERAL ELECTRICAL NOTES

1. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE, STATE LAWS, AND ALL OTHER REGULATIONS GOVERNING WORK OF THIS NATURE.
2. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIAL, AND LABOR TO SATISFY A COMPLETE AND WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.
3. THE CONTRACTOR SHALL SECURE ALL PERMITS OR APPLICATIONS AND PAY ANY AND ALL FEES AS REQUIRED.
4. CONTRACTOR TO CONFIRM EXACT LOCATION OF EXISTING AND NEW EQUIPMENT WITH OWNERS AGENTS.
5. CABLE RUNS ARE DIAGRAMMATICALLY SHOWN ON THE DRAWING. FINAL ROUTING SHALL BE DETERMINED BY THE ELECTRICAL CONTRACTOR AND APPROVED BY THE OWNER.
6. ALL LIGHTING POLES, BOLLARDS AND SIGNS SHALL BE GROUNDED AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.
7. ALL EQUIPMENT AND OUTDOOR WIRING SHALL BE WEATHERPROOF.
8. UNDERGROUND CABLE SHALL BE U.L. APPROVED FOR UNDERGROUND INSTALLATION, WET LOCATION TYPE.
9. CABLE RUNS UNDER ROADS, PARKING AREAS, SIDEWALKS, AND OTHER PAVED AREAS SHALL BE INSTALLED IN CONDUIT.
10. CABLE CONDUIT TRENCH SHALL BE 36" DEEP WITH 4" SAND BEDDING AND 4" SAND COVER INSTALLED OVER CABLE BEFORE BACKFILLING.
11. CABLE CONDUIT RUNS SHALL BE MARKED WITH RED PLASTIC MARKING TAPE INSTALLED IN THE TRENCH ONE FOOT BELOW SURFACE.
12. SCHEDULING OF THE TRENCHING AND INSTALLATION OF CABLE CONDUITS SHALL BE COORDINATED WITH OTHER TRADES AND APPROVED BY THE OWNER.
13. FIELD MOUNTED DEVICES SUCH AS SWITCHES, MOTOR STARTERS, RECEPTACLES, ETC., ARE SHOWN IN THEIR APPROXIMATE LOCATION. SWITCH MOUNTING HEIGHT SHALL BE 48" ABOVE FINISHED FLOOR AND RECEPTACLE MOUNTING HEIGHT SHALL BE 18" ABOVE FINISHED FLOOR IN ADMINISTRATION AND OFFICE AREAS (UNLESS OTHERWISE NOTED).
14. POWER WIRING SHALL BE COPPER STRANDED CONDUCTOR WITH "THW" INSULATION RATED 600 VOLTS. MINIMUM WIRE SIZE OF POWER WIRING SHALL BE #12 AWG. LIGHTING AND RECEPTACLE BRANCH CIRCUIT WIRING SHALL BE #12 AWG, MINIMUM CONDUIT SIZE SHALL BE 3/4" UNLESS OTHERWISE NOTED ON DRAWINGS OR SCHEDULES.
15. HOME RUN CIRCUITS MORE THAN 75 FEET FROM THE PANELBOARD SHALL BE MADE WITH #10 AWG OR LARGER AS REQUIRED TO LIMIT VOLTAGE DROP TO 2% MAXIMUM.
16. THE TYPE OF CONDUIT SHALL BE AS STATED IN THE SPECIFICATIONS.

    UNDERGROUND — PVC SCH40
17. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL GROUNDING SYSTEMS (AS REQUIRED) IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. RE: E001.
18. ALL RECEPTACLES SHALL BE GROUNDING TYPE.
19. ALL RECEPTACLES OUTDOORS, ON ROOFTOPS OR IN INDOOR WET LOCATIONS, SHALL HAVE GROUND-FAULT CIRCUIT INTERRUPTER PROTECTION AS REQUIRED BY THE NATIONAL ELECTRICAL CODE 5mA FOR PERSONAL PROTECTION.
20. ALL ELECTRIC MATERIALS AND EQUIPMENT FOR THE PROJECT SHALL BE NEW AND U.L. OR EQUALLY APPROVED.
21. CONTRACTOR TO CONFIRM EXACT LOCATION OF METERS WITH ELECTRIC UTILITY.
22. SUBMIT TO THE OWNER CERTIFICATES OF INSPECTIONS IN DUPLICATE FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION.
23. ALL ELECTRICAL WORK SHALL BE COORDINATED WITH THE MECHANICAL WORK AS CALLED FOR IN MECHANICAL SPECIFICATIONS.
24. ELECTRICAL FIELD STUB-UPS SHALL BE PROVIDED PER STANDARD DETAIL E005.
25. JOINT TRENCH WORK TO INCLUDE INSTALLATION OF OTHER DRY UTILITIES (FIBER OPTICS, ELECTRICAL). COORDINATE WITH RELATED TRADES.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

ELECTRICAL NOTES & SYMBOLS

DRAWN: TLL | CHECK: BMC

VERIFY SCALE: Scales based on 22"x34" prints.

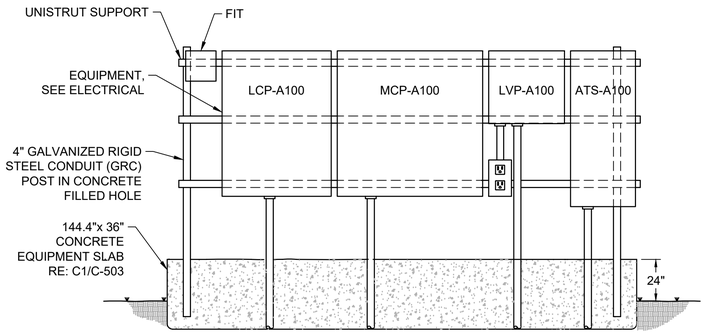
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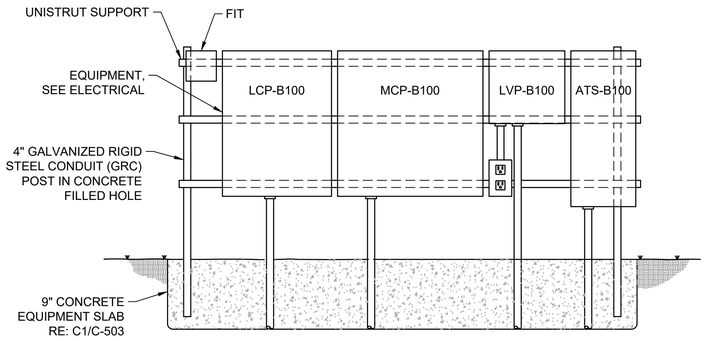
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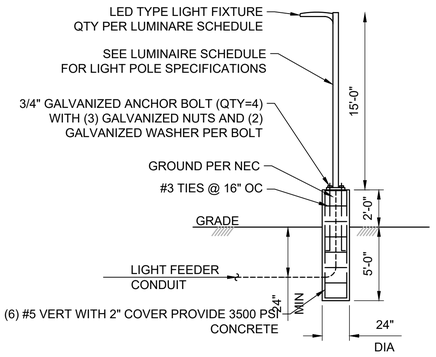
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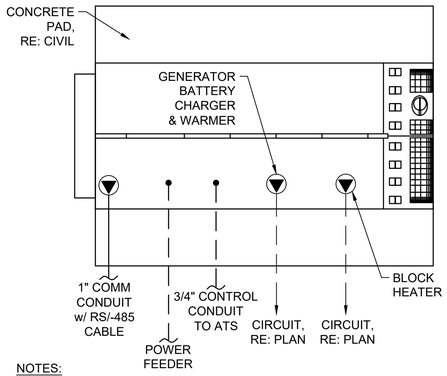
A11 STRUCTURE A UNISTRUT EQUIPMENT RACK DETAIL
N.T.S.



A14 STRUCTURE B UNISTRUT EQUIPMENT RACK DETAIL
N.T.S.

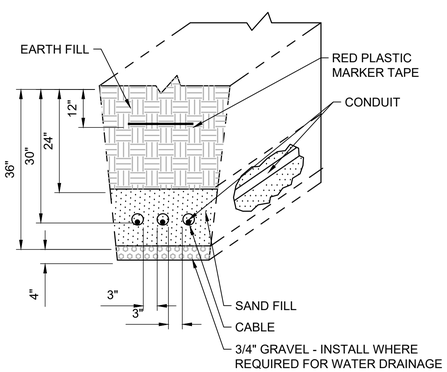


E027 LIGHTING POLE INSTALLATION LED FIXTURE
N.T.S.

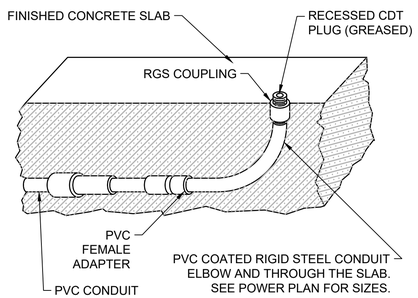


NOTES:
1. E.C. TO COORDINATE EXACT LOCATION OF ALL CONNECTIONS WITH GENERATOR MANUFACTURER SHOP DRAWINGS.

E033 GENERATOR CONNECTION
N.T.S.

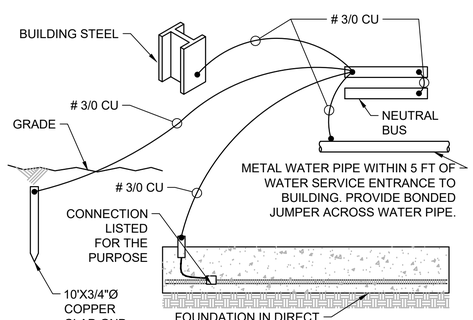


E003 INSTALLATION OF UNDERGROUND CONDUITS
N.T.S.

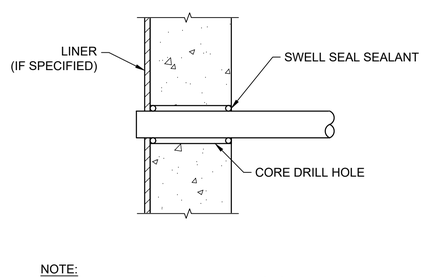


INSTALLATION OF PVC CONDUIT EMERGING FROM CONCRETE SLAB
E005
N.T.S.

NOTE:
1. CONNECTIONS SHALL BE FIRMLY BONDED TO NEUTRAL BUS, BUILDING STEEL, GROUNDING ROD AND WATER PIPE

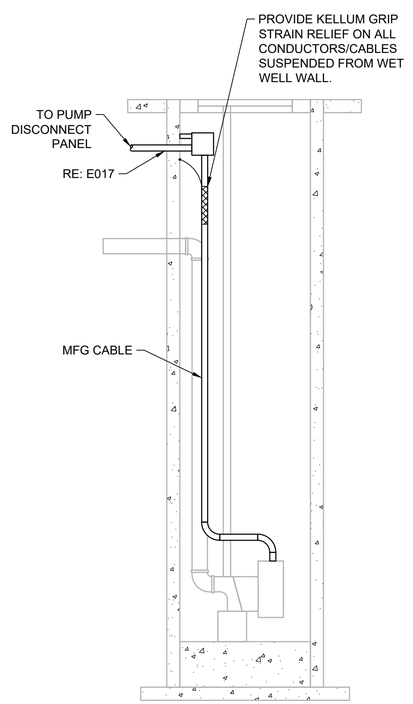


E006 GROUNDING SYSTEM
N.T.S.



NOTE:
APPLY LINER AFTER ALL PENETRATIONS ARE MADE

E017 CONDUIT PENETRATION
N.T.S.



CONDUCTOR CABLES SUSPENDED FROM WALL
E018
N.T.S.

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

ELECTRICAL DETAILS

DRAWN: ACM CHECK: BMC

VERIFY SCALE: Scales based on 22"x34" prints.
1-1/2 Inches

PROJECT NO. 223072 PAGE

SHEET NO. E-501

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INSTRUMENT AND SIGNAL LINE LEGEND

- INSTRUMENT CONNECTION TO PROCESS
- CONTROL WIRING
- POWER WIRING
- PNEUMATIC
- HYDRAULIC
- CAPILLARY TUBE
- ETHERNET
- FIBER — FO
- RADIO — R — R
- SERIAL — S — S
- CABLE SPLICE — X
- INTERLOCK — I

INPUT AND OUTPUT SYMBOLS LEGEND

- DIGITAL INPUT
- DIGITAL OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT
- PULSED INPUT
- NETWORK/COMMUNICATIONS
- SIGNAL CONTINUATION — X

OFF-PAGE CONNECTORS

- NOTE / # PROCESS # / NOTE — PROCESS TAG LEFT
- NOTE / # PROCESS # / NOTE — PROCESS TAG RIGHT
- STRUCTURE / X # SHEET # / STRUCTURE — SHEET REFERENCE LEFT
- STRUCTURE / # SHEET # X / STRUCTURE — SHEET REFERENCE RIGHT

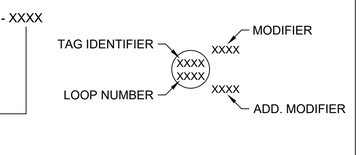
INSTRUMENT TAG IDENTIFICATION LETTERS

MEASURED VARIABLE \ INSTRUMENT FUNCTION		ELEMENT	TRANSMITTER	INDICATING TRANSMITTER	CONVERTER TRANSDUCER RELAY, SPECIAL DEVICES	INDICATOR	RECORDER	CONTROLLER	SWITCH	SWITCH LOW LOW	SWITCH LOW	SWITCH HIGH	SWITCH HIGH HIGH	ALARM LOW LOW	ALARM LOW	ALARM HIGH	ALARM HIGH HIGH	TOTALIZE	DIFFERENTIAL	VALVE	GAUGE	LIGHT
A	ANALYSIS	AE	AT	AIT	AY	AI	AR	AC	AS	ASLL	ASL	ASH	ASHH	AALL	AAL	AAH	AAHH					AL
B	BURNER FLAME	BE	BT	BIT	BY	BI	BR	BC	BS	BSLL	BSL	BSH	BSHH	BALL	BAL	BAH	BAHH					BL
C	CONDUCTIVITY	CE	CT	CIT	CY	CI	CR	CC	CS	CSLL	CSL	CSH	CSHH	CALL	CAL	CAH	CAHH					CL
D	DENSITY	DE	DT	DIT	DY	DI	DR	CD	DS	DSLL	DSL	DSH	DSHH	DALL	DAL	DAH	DAHH					DL
E	VOLTAGE	EE	ET	EIT	EY	EI	ER		ES	ESLL	ESL	ESH	ESHH	EALL	EAL	EAH	EAHH					EL
F	FLOW	FE	FT	FIT	FY	FI	FR	FC	FS	FSLL	FSL	FSH	FSHH	FALL	FAL	FAH	FAHH	FQ	FD	FV	FG	FL
G	GAUGE																					
H	HAND							HC	HS											HV		HL
I	CURRENT	IE	IT	IIT	IY	II	IR	IC	IS	ISLL	ISL	ISH	ISHH	IALL	IAL	IAH	IAHH					IL
J	POWER	JE	JT	JIT	JY	JI	JR	JC	JS	JSLL	JSL	JSH	JSHH	JALL	JAL	JAH	JAHH					JL
K	TIME				KY	KI	KR	KC	KS	KSLL	KSL	KSH	KSHH	KALL	KAL	KAH	KAHH					KL
L	LEVEL	LE	LT	LIT	LY	LI	LR	LC	LS	LSLL	LSL	LSH	LSHH	LALL	LAL	LAH	LAHH		LD	LV	LG	LL
M	MOISTURE/HUMIDITY	ME	MT	MIT	MY	MI	MR	MC	MS	MSLL	MSL	MSH	MSHH	MALL	MAL	MAH	MAHH					ML
N	TORQUE	NE	NT	NIT	NY	NI	NR	NC	NS	NSLL	NSL	NSH	NSHH	NALL	NAL	NAH	NAHH					NL
P	PRESSURE OR VACUUM	PE	PT	PIT	PY	PI	PR	PC	PS	PSLL	PSL	PSH	PSHH	PALL	PAL	PAH	PAHH		PD	PV	PG	PL
Q	QUANTITY	QE	QT	QIT	QY	QI	QR	QC	QS	QSLL	QSL	QSH	QSHH	QALL	QAL	QAH	QAHH					QL
R	RADIATION	RE	RT	RIT	RY	RI	RR	RC	RS	RSLL	RSL	RSH	RSHH	RALL	RAL	RAH	RAHH					RL
S	SPEED	SE	ST	SIT	SY	SI	SR	SC	SS	SSLL	SSL	SSH	SSHH	SALL	SAL	SAH	SAHH					SL
T	TEMPERATURE	TE	TT	TIT	TY	TI	TR	TC	TS	TSLL	TSL	TSH	TSHH	TALL	TAL	TAH	TAHH		TD	TV		TL
U	MULTIVARIABLE	UE	UT	UIT	UY	UI	UR	UC	US													UL
V	VIBRATION	VE	VT	VIT	VY	VI	VR	VC	VS	VSLL	VSL	VSH	VSHH	VALL	VAL	VAH	VAHH					VL
W	WEIGHT	WE	WT	WIT	WY	WI	WR		WS	WSLL	WSL	WSH	WSHH	WALL	WAL	WAH	WAHH					WL
X	UNCLASSIFIED	XE	XT	XIT	XY	XI	XR	XC	XS	XSLL	XSL	XSH	XSHH	XALL	XAL	XAH	XAHH			XV	XG	XL
Y	EVENT / STATUS				YY	YI	YR	YC	YS													YL
Z	POSITION	ZE	ZT	ZIT	ZY	ZI	ZR	ZC	ZS	ZSLL	ZSL	ZSH	ZSHH	ZALL	ZAL	ZAH	ZAHH					ZL

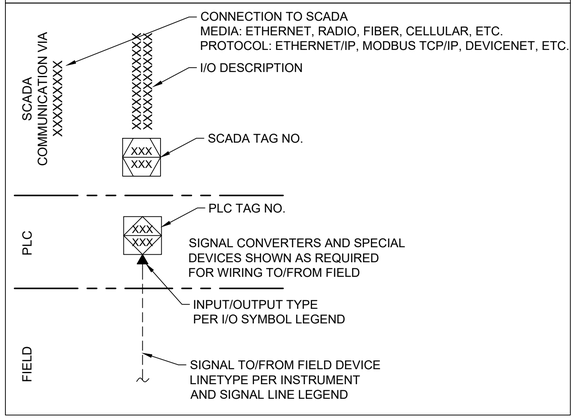
INSTRUMENT SYMBOLS, ACCESSORIES, AND SPECIAL DEVICES

- XX — FIELD INSTRUMENTATION
- XX XX — INSTRUMENTS OR OTHER COMPONENTS SHARING A COMMON HOUSING
- XX — INSTRUMENT OR OTHER COMPONENT MOUNTED ON MAIN OR PRIMARY PANEL
- XXX — INSTRUMENT OR OTHER COMPONENT MOUNTED ON LOCAL OR SECONDARY PANEL
- XXX (FUNCTION / LOCAL INDICATING LIGHT / LIGHT) — LIGHT COLOR ABBREVIATIONS: GRN = GREEN, WHT = WHITE, RED = RED, BLU = BLUE, AMB = AMBER
- HORN
- INSTRUMENT OR OTHER COMPONENT MOUNTED IN REAR OF MAIN PANEL
- INSTRUMENT OR OTHER COMPONENT MOUNTED IN REAR OF LOCAL OR SECONDARY PANEL
- XXX / XXX — PLC INPUTS/OUTPUTS
- XXX / XXX — HMI SCREEN INDICATION AND CONTROLS
- XXX / XXX — SCADA SYSTEM
- H,HH / L,LL — I/O SETPOINTS AND ALARMS AS INDICATED
- XXX — DEVICE POWER (VOLTAGE, AC/DC AS NOTED)
- EQUIPMENT TAG
- AMP — SIGNAL AMPLIFIER
- CT — CURRENT TRANSFORMER
- XXXX / 888.88 — DIGITAL DISPLAY TYPE AS NOTED
- HMI — HUMAN-MACHINE INTERFACE
- IB — INTRINSIC BARRIER
- R — RELAY
- SIGNAL TO / CONV / SIGNAL FROM — SIGNAL CONVERTER
- ISO — SIGNAL ISOLATOR
- SLR — SEAL LEAK RELAY
- SPL — SIGNAL SPLITTER
- TDR — TIME DELAY RELAY

INSTRUMENTATION / DEVICE TAGS



PLC & SCADA I/O LEGEND



GENERAL ABBREVIATIONS

AFF	ABOVE FINISH FLOOR
AG	ABOVE GROUND
ATM	ATMOSPHERE
BYP	BYPASS
EL	ELEVATION
ETM	ELAPSED TIME METER
FC	FAIL CLOSE
FO	FAIL OPEN
FOR	FORWARD / OFF / REVERSE
FL	FAIL LAST
HMI	HUMAN-MACHINE INTERFACE
HOA	HAND/OFF/AUTOMATIC
HPT	HIGH POINT
HS	HAND SWITCH
JKT	JACKET
KO	TIMER/OFF
LC	LOCKED CLOSE
LCP	LOCAL CONTROL PANEL
LCS	LOCAL CONTROL STATION
LO	LOCKED OPEN
LOR	LOCAL/OFF/REMOTE
LPT	LOW POINT
LR	LOCAL/REMOTE
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CONTROL PANEL
MIN	MINIMUM
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NNF	NORMALLY NO FLOW
OC	OPEN/CLOSE
OH	OVERHEAD
OOS	OUT OF SERVICE
PLC	PROGRAMMABLE LOGIC CONTROLLER
POT	POTENTIOMETER
RCP	REMOTE CONTROL PANEL
REQD	REQUIRED
RSL	RAISE/STOP/LOWER
RTU	REMOTE TELEMETRY UNIT
SCADA	SUPERVISORY CONTROL AND DATA ACCESS
SEL	SELECT
SP	SET POINT
SMP	SAMPLE POINT
TL	TANGENT LINE
TSO	TIGHT SHUTOFF
UG	UNDER GROUND
VAC	VACUUM
VCP	VENDOR CONTROL PANEL
VT	VENT

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SANDPOINT

LIFT STATION REPLACEMENTS

P&ID LEGEND & SCHEDULE

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PROCESS AND PIPING LINE LEGEND

MAIN PROCESS

SECONDARY PROCESS

CONNECTING LINES

NON-CONNECTING LINES

PIPING SPECIFICATION BREAK (AT LOWER PRESSURE SIDE WELD)

DIRECTION FLOW

SLOPING LINES (1%)

ELECTRICAL TRACING

JACKETED

FLANGES

PROJECT SCOPE LEGEND

EXISTING ITEM

NEW ITEM

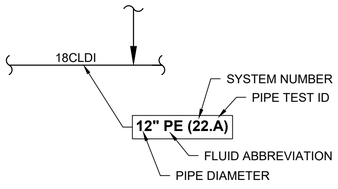
FUTURE ITEM

DEMOLITION ITEM

(R) RELOCATED/TO BE RELOCATED ITEM

(V) VENDOR PROVIDED EQUIPMENT

LINE SIZE AND MATERIAL IDENTIFICATION



NOTE: REFER TO G-XXX, PIPE SCHEDULE FOR SYSTEM NUMBER, PIPE TEST ID AND FLUID ABBREVIATIONS

BOUNDARIES

ABOVE GROUND / UNDERGROUND — UG / AG

LINE MATERIAL CLASS — SPEC 1 / SPEC 2

INTERFACE BETWEEN CONTRACTOR/VENDOR — VENDOR

INSULATION BREAK — N / H

VENDOR EQUIPMENT LIMITS PACKAGED

BATTERY LIMITS (BUILDING ENTRY/EXIT)

WATER SURFACE

PROCESS SERVICE CODES

AL	ALUM
ALP	AIR LOW PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CHM	CHEMICAL
CIP	CLEAN IN PLACE
CLS	CHLORINE SOLUTION
CSL	CIRCULATED SLUDGE
DR	DRAIN
DG	DIGESTER GAS
DS	DIGESTED SLUDGE
FA	FOUL AIR
FC	FERRIC CHLORIDE
FLT	FILTRATE
HSL	HEATED SLUDGE LINE
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
ML	MIXED LIQUOR
NG	NATURAL GAS
OF	OVERFLOW
PD	PUMPED DRAIN/PLANT DRAIN
PE	PRIMARY EFFLUENT
PLR	POLYMER
PS	PRESSURE SEWER
RAS	RETURN ACTIVATED SLUDGE
RS	RAW SEWAGE
SA	SAMPLE
SCM	SCUM
SD	STORM DRAIN
SE	SECONDARY EFFLUENT
SLD	SLUDGE
SPD	SUMP PUMP DISCHARGE
SS	SANITARY SEWER (GRAVITY)
TE	TERTIARY EFFLUENT
V	VENT
WAS	WASTE ACTIVATED SLUDGE

PIPING COMPONENTS

Y STRAINER

ACCUMULATOR

BASKET STRAINER

AREA DRAIN

CONDENSATE TRAP

DEMISTER

EJECTOR / EDUCTOR

COLLECTION TO DRAIN

PIPING COMPONENTS

SAMPLE POINT (SP)

BREATHER

DAMPER

VENT COVER

SILENCER (S)

AIR FILTER

EXPANSION JOINT

FLEXIBLE HOSE OR CONNECTION

FLOW CONDITIONER

EXPANSION CHAMBER

FLOOR DRAIN

GRINDER

HOSE RACK

STATIC MIXER

IN-LINE MIXER

PULSATION DAMPENER

ROOF DRAIN

RUPTURE DISK

SIGHT GLASS

SURGE DAMPENER

TRENCH DRAIN

WAFER-TYPE STATIC MIXER

PIPE FITTINGS

FLANGE

FLANGE, REDUCING

ORIFICE UNION

ECCENTRIC UNION (FLAT SIDE DOWN)

ECCENTRIC UNION (FLAT SIDE UP)

CAP (THREADED)

CAP (WELDED)

HOSE CONNECTION

PLUG

CAP

HOSE CONNECTION (FEMALE)

HOSE CONNECTION (MALE)

REDUCER

FLEXIBLE HOSE

BLIND FLANGE

EQUIPMENT

TANK OPEN

TANK CLOSED

TANK COVERED

TANK, DOME ROOF

TANK, CONE ROOF

TANK, DOUBLE WALL

TOTE

DRUM

VESSEL

EQUIPMENT

BIN

HEATER

BARREL

OPEN BULK STORAGE

CONVEYOR

ROTARY FEEDER

AUTOMATIC TRANSFER SWITCH

GENERATOR

MANUAL BAR SCREEN

PLATE AND FRAME HEAT EXCHANGER

SHELL AND TUBE HEAT EXCHANGER

AERATOR

FAN

ELECTRIC MOTOR

AGITATOR / MIXER

SCREW CONVEYOR

SOFT STARTER

STARTER

VARIABLE FREQUENCY DRIVE

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(208) 758-8601

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SANDPOINT

LIFT STATION REPLACEMENTS

P&ID SYMBOLS LEGEND

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ACCESSORIES AND MISCELLANEOUS

- ANNULAR SEAL
- REMOTE ELECTRONIC PRESSURE SENSOR
- CALIBRATION COLUMN
- DIAPHRAGM SEAL, FLANGED
- DIAPHRAGM SEAL THREADED OR SANITARY
- HORN
- PIGTAIL
- ROOM THERMOSTAT
- SNUBBER
- THERMOWELL
- AIR REGULATOR/FILTER

FLOW METERS

- VENTURI FLOW METER
- MAGNETIC FLOW METER
- INSERTION MAGNETIC FLOW METER
- CORIOLIS FLOW METER
- PLATE FLOW METER dP/ORIFICE
- PARSHALL FLUME FLOW METER
- WEIR FLOW METER
- PITOT TUBE FLOW METER
- AVERAGING PITOT FLOW METER
- TURBINE FLOW METER
- ROTAMETER
- THERMAL DISPERSION FLOW METER

FLOW METERS

- ULTRASONIC FLOW METER
- CLAMP ON FLOW METER
- VORTEX FLOW METER

LEVEL

- FLOAT SWITCH
- FLOAT SWITCH, TILT-TYPE
- TUNING FORK
- CAPACITANCE
- GUIDED WAVE RADAR
- RADAR, NON-CONTACT
- ULTRASONIC
- LASER
- INDUCTIVE RELAY LEVEL SWITCH
- SUBMERSIBLE PRESSURE

PUMPS

- CENTRIFUGAL PUMP, FAN, OR BLOWER
- VERTICAL MULTI-STAGE CENTRIFUGAL PUMP
- BLOWER OR COMPRESSOR
- TURBINE PUMP
- DIAPHRAGM PUMP
- POSITIVE DISPLACEMENT PUMP
- EJECTOR PUMP

PUMPS

- GEAR PUMP
- CHEMICAL METERING PUMP
- PISTON COMPRESSOR
- RECIPROCATING PUMP
- ROTARY VANE PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- ROTARY LOBE PUMP
- PERISTALTIC PUMP
- VACUUM PUMP
- VERTICAL TURBINE LINESHAFT PUMP

SAFETY EQUIPMENT

- HOSE REEL
- EYE WASH
- SAFETY SHOWER
- SPRINKLER

VALVES

- ANGLE VALVE
- THREE-WAY VALVE
- FOUR-WAY VALVE
- AIR RELEASE VALVE

VALVES

- BALL VALVE
- GATE VALVE
- GLOBE VALVE
- NEEDLE VALVE
- PINCH VALVE
- PLUG VALVE
- PRESSURE REGULATING VALVE
- BACK-PRESSURE REGULATING VALVE
- PRESSURE SAFETY VALVE
- SLIDE GATE
- STOP OR SHEAR GATE
- PRESSURE SAFETY VALVE WITH VENT
- VACUUM SAFETY VALVE
- VEE BALL VALVE
- BALANCED WEIGHT VALVE
- BALL CHECK VALVE
- BALL CHECK VALVE, SPRING LOADED
- BUTTERFLY VALVE
- CHECK VALVE
- ALTITUDE / BACK PRESSURE CONTROL VALVE
  LIMIT SWITCHES AND SOLENOIDS TO BE ADDED AS REQUIRED
- DIAPHRAGM VALVE
- DUCKBILL CHECK VALVE

VALVE ACTUATORS

- PNEUMATIC DIAPHRAGM SPRING-OPPOSED, SINGLE OR DOUBLE ACTING
- VALVE POSITIONER
- HYDRAULIC OR PNEUMATIC CYLINDER ACTUATOR
- HANDWHEEL, USED WITH ANY ACTUATOR
- MANUAL ACTUATOR
- MOTOR ACTUATOR
- SOLENOID ACTUATOR

VALVE FAILURE STATE SHOWN BENEATH VALVE
FO = FAIL OPEN FC = FAIL CLOSED
FL = FAIL LAST

KELLER ASSOCIATES
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

PROFESSIONAL ENGINEER LICENSED
AS018 19242 8/7/2024
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SANDPOINT

LIFT STATION REPLACEMENTS

P&ID SYMBOLS LEGEND

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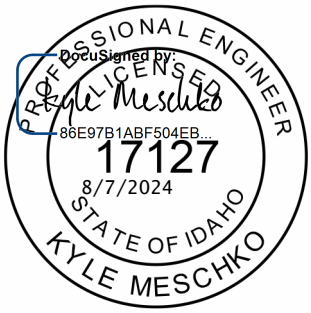
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AUG 2024
PROJECT NO. 223072

CITY OF SANDPOINT

SPECIFICATIONS

LIFT STATION REPLACEMENTS



PREPARED BY

KELLER ASSOCIATES

KELLER ASSOCIATES, INC.
601 Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
(208) 758-8601

PREPARED FOR

SANDPOINT

1123 W. Lake Street
Sandpoint, Idaho 83864

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DRAWINGS (BOUND SEPARATELY)

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SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work to be performed under this Contract shall consist of furnishing tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The Work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents, which may be necessary for the complete and proper construction of the Work in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the Owner. The Contractor shall provide all materials and equipment required for construction of the facility except for the materials and equipment provided by City Controls Integrator, as described in Plans.

B. The Contractor is responsible for following the provisions of these Contract Documents, including but not limited to: the following of Plans and Specifications, 2020 ISPWC, and the City of Sandpoint Sewer Rules and Regulations 2023; the timely, complete, and accurate submittal of shop drawings; the work of and correlation with their subcontractors and suppliers; timely performance of the Contract; and timely payment of suppliers and subcontractors. Nothing stated in the Contract Documents or Specifications shall be construed to relieve the Contractor of these basic responsibilities.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Overview: The Work of this Contract comprises the construction of the City Beach Lift Station and Superior Street Lift Station for the City of Sandpoint, Idaho, as specified and shown, with all appurtenances necessary to create an operational facility.

B. Project Elements – The major project elements for the lift station construction projects are listed below:

1. City Beach Lift Station

2. Civil Site Work

a. Earthwork excavation for wet well, valve vault, equipment pads, and manholes denoted on the Drawings.

b. Dewatering, as necessary, of excavations to accommodate concrete placement and pipe placement.

c. Placement of all backfill, including native and imported materials.

d. Yard piping, including water line and yard hydrant, gravity sewer pipe and manholes, and pressure sewer line.

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e. Miscellaneous site work, including grading, fencing, and site lighting.

f. Trenching, backfill, and compaction associated with natural gas and underground electrical and control conduits and utilities beyond Avista Utilities meter assemblies.

g. Grading for roadways and sidewalks.

3. Lift Station

a. Install precast wet well and precast valve vault, including lids, hatch openings, odor control, and venting.

b. Installation of mechanical piping, fittings, couplers, flow meter, valves, pumps, air release assemblies, and appurtenances.

c. Installation of both Contractor and City integrator furnished instrumentation; see Equipment Matrix Responsibility, G-006 in Plans.

d. Protective coatings for ductile iron mechanical piping.

e. Installation of cast-in-place concrete slab for control panel.

f. Installation of lift station control panels (furnished by City Integrator) and all associated conduit, wire, and pull boxes.

4. Generator and ATS

a. Cast-in-place concrete slabs for new generator.

b. Installation of generator and ATS and connection to on-site natural gas supply.

5. Roadway and Surface Repairs

a. Demolition, saw cutting, removal, and disposal of existing surface cover along pipeline corridors and as indicated in Drawings.

b. Asphalt, gravel, and sidewalk surface repairs, as shown on Drawings.

c. Miscellaneous surface feature repairs and replacements, including, but not limited to, signs, utility boxes, and vegetation.

d. Temporary traffic control and stormwater pollution prevention and erosion and sediment control measures.

6. Existing Lift Station and Building

a. Remove and dispose of existing lift station pumps, piping, building, and concrete slab and abandon wet well, as shown in Drawings, after completion of new lift station.

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2. Superior Street Lift Station

3. Civil Site Work

a. Earthwork excavation for wet well, valve vault, and equipment pads.

b. Dewatering, as necessary, of excavations to accommodate concrete placement and pipe placement.

c. Placement of all backfill including native and imported materials.

d. Yard piping, including water line and yard hydrant, gravity sewer and manhole, and pressure sewer pipe.

e. Miscellaneous site work, including grading, bollards, and site lighting.

f. Trenching, backfill, and compaction associated with natural gas and underground electrical and control conduits and utilities beyond Avista Utilities meter assemblies.

g. Grading for roadways and sidewalks.

4. Lift Station

a. Install precast wet well and precast valve vault, including lids, hatch openings, and venting.

b. Installation of mechanical piping, fittings, couplers, flow meter, valves, pumps, air release assemblies, and appurtenances.

c. Installation of both Contractor and City integrator furnished instrumentation; see Equipment Matrix Responsibility, G-006 in Plans.

d. Protective coatings for ductile iron mechanical piping.

e. Installation of cast-in-place concrete slab for control panel.

f. Installation of lift station control panels (furnished by City Integrator) and all associated conduit, wire, and pull boxes.

5. Generator and ATS

a. Cast-in-place concrete slabs for new generator.

b. Installation of generator and ATS and connection to on-site natural gas supply.

6. Roadway and Surface Repairs

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a. Demolition, saw cutting, removal, and disposal of existing surface cover along pipeline corridors and as indicated in Drawings.

b. Gravel surface repair, as shown on Drawings.

c. Miscellaneous surface feature repairs and replacements, including, but not limited to utility boxes and vegetation.

d. Temporary traffic control and stormwater pollution prevention and erosion and sediment control measures.

7. Existing Lift Station and Building

a. Remove and dispose of existing lift station pumps, piping, building, concrete slab, and wet well after completion of new lift station.

1.3 CONTRACT METHOD

A. The Work hereunder will be constructed per the bid table.

1.4 WORK BY OTHERS

A. Interference with Work on Utilities: The Contractor shall cooperate fully with all utility forces of the Owner or forces of other public or private agencies engaged in the construction, relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the Work, and shall schedule the Work so as to minimize interference with said construction. Contract includes installation of a new electrical service and a new natural gas service line to the facilities. Contractor to coordinate with and pay any fees owed to Avista Utilities for gas and electric service installation.

B. Contractor to coordinate provision and installation of instrumentation and control elements, programming, and startup with Owner's controls integrator and equipment vendors. Contractor to coordinate startup and testing with the Owner at least two weeks prior to startup. The Owner's SCADA integrator will also be present during startup.

1.5 CONSTRUCTION PROGRESS SCHEDULE

A. Work under the contract shall be scheduled and performed in such a manner as to result in the least possible disruption to the operation of the existing facilities. Contractor shall not operate any existing valves, pumps, or motors. The Contractor shall submit to the Engineer a construction schedule covering the entire work before any work is commenced. The schedule shall be as described in Section 01 32 16 – Construction Progress Schedule, complete with estimated dates for start and finish of each item of work. The construction constraints are as described in Section 01 35 13 - Special Project Procedures. The construction sequences described therein are suggested methods to accomplish the work. The Contractor shall remain responsible for the successful completion of all work.

B. To minimize the period of disruption of facility operation, all new piping and/or facilities should be constructed and all preparations shall be made for fast connection to existing piping and facilities.

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C. Submit preliminary construction progress schedules as required within ten (10) days after the award of the contract. The progress schedule is to be in reproducible form and subject to the approval of the Engineer.

D. Commence work on or before a date to be specified in a written "Notice to Proceed" and complete all phases of the work as specified in Section 00 52 13 – Agreement Form.

E. The time is computed on a calendar basis. The contractor acknowledges that construction during the winter at the project site will require cold weather construction methods. However, at the contractor's discretion, a formal request for a winter shutdown can be made to the Engineer, during which time contract times will be paused and no work is permitted to occur onsite.

1.6 PUBLIC WORKS CONTRACTOR'S LICENSE

A. Any Contractor, Subcontractor, or Specialty Contractor is required to have a current license as a Public Works Contractor in the State where the work is to be completed in order to submit a bid or proposal on this contract.

1.7 CODES AND STANDARDS

A. Where codes and standards are referred to, they are the current approved codes. It is the duty of the Contractor to obtain from its supplier any material on this work to submit evidence, if requested, that provided material is in compliance with the applicable codes and standards.

1.8 STATE AND LOCAL LAWS

A. Conform to all applicable State and local laws in carrying out obligations under the contract.

B. Meet the requirements and recommendations of the Manual of Accident Prevention in Construction; Associated General Contractors of America, Inc., and Occupational Safety and Health Act.

1.9 PREDETERMINED EQUIPMENT COSTS

A. The following methods of determination of construction equipment costs apply to all Change Orders and other adjustments of contract price except for Article 15, Suspension of Work and Termination, outlined in the General Conditions.

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1. Allowable ownership and operating expense costs for construction equipment in sound workable conditions owned and furnished by the Contractor for work requiring adjustments in contract price shall be based on the applicable provisions of the U.S. Army Corps of Engineers North Pacific Division (NPD) "Equipment Ownership and Operating Expense Schedule." If, for any reason, the schedule referred to above is discontinued or becomes otherwise unavailable, the Owner and the Contractor shall agree upon another schedule or method of price adjustment which, in their opinion, will result in an equitable adjustment of contract price. For forwarding pricing, the issue of NPD Schedule in effect at the time of negotiations shall apply. For retrospective pricing, the issue of the NPD Schedule in effect as of the time work was performed shall apply.

2. For the purpose of determination of the hourly rates to be applied under this contract, working conditions shall be considered to be average unless otherwise determined by the Owner. Rate for equipment not in the schedule may be used for unlisted equipment of comparable horsepower and auxiliary features.

3. For rented equipment, the Owner will accept rates actually paid (substantiated by certified reproduced copies of invoices or bills), but in no event shall they exceed the rates contained in the current "Rental Rate Blue Book for Construction Equipment," published by Equipment Guide-Book Company, 3980 Fabian Way, Palo Alto, California 94303. When the "Blue Book" rates are applied, fuel, lubricants and operating expendables will be computed in accordance with NPD Schedule. Additional shifts or fractions thereof for rented equipment will be computed at 50 percent of the base rate in the "Blue Book" or invoices, as applicable. Rates for equipment under lease-purchase or sale-leaseback arrangements will be determined in accord with NPD Schedule. Rates for 1equipment rented from an organization under common control will be determined in accord with the NPD Schedule, and no markup will be permitted. A copy of the NPD Schedule will be provided to the successful bidder upon request.

1.10 PRODUCT SUBSTITUTIONS

A. Use equipment and materials specified by name in these Specifications or on Plans. Alternative equipment suppliers shall be reviewed prior to bid opening , as outlined in Section 01 25 13 – Product Substitution Procedures.

B. Request approval for substitutions by submitting written evidence and convincing Engineer of equality of item and suitability for the service and/or construction conditions anticipated.

C. If alternative equipment or materials are approved, make required changes in structures, buildings, piping, systems, etc., necessary to accommodate alternate items without additional cost to the Owner or Engineer.

1.11 PERMITS

A. The Contractor shall be responsible to obtain and pay for all construction and inspection permits required by the State of Idaho, Bonner County, and the City of Sandpoint and shall include permit fees in the base bid.

B. Building permit (includes structural) shall be obtained from the City.

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C. Electrical and plumbing permits shall be obtained from the Idaho Division of Building Safety, and the State will charge a permit fee based on the cost of materials and labor for the plumbing work and the electrical work. State permits may be obtained online at dbs.idaho.gov.

1.12 WAGE RATES

A. The general prevailing rate of wages, as determined by the Secretary of Labor, is not a requirement of this project.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 11 00

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SECTION 01 14 13 - ACCESS TO SITE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the Work. It shall be the Contractor's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS

A. General: Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. The Contractor shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.

B. Temporary Bridges: Wherever necessary, to maintain vehicular crossings, the Contractor shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the Contractor shall secure the written consent of the responsible individuals or authorities to omit such temporary bridges or steel plates, which written consent shall be delivered to the Engineer prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the Contractor shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

C. Street Use: Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alleyway, or parking area during the performance of the Work hereunder, and it shall conduct its operations to not interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the Engineer and proper governmental authority. Where excavation is being performed in streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the Engineer or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

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1.3 CONTRACTOR'S WORK AND STORAGE AREA

A. The Owner will designate and arrange for the Contractor's use, a portion of the property adjacent to the Work for its exclusive use during the term of the Contract as a storage and shop area for its construction operations on the Work. At completion of Work, the Contractor shall return this area to its original condition, including grading and landscaping.

B. The Contractor shall make its own arrangements for any necessary off-Site storage or shop areas necessary for the proper execution of the Work.

C. The Contractor shall construct and use a separate storage area for hazardous materials used in constructing the Work as specified in Section 01 57 12 - Construction Site Discharge.

1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

2. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.

3. The Contractor shall develop and submit to the Engineer a plan for storing and disposing of the materials above.

4. The Contractor shall obtain and submit to the Engineer a single EPA number for wastes generated at the Site.

5. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.

6. The separate storage area shall be inspected by the local Fire Chief prior to construction of the area, upon completion of construction of the area, and upon cleanup and removal of the area.

7. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.4 PARKING

A. The Contractor shall:

1. Provide temporary parking areas for its employees and construction equipment.

2. The Contractor shall direct its employees to park in areas indicated. No Contractor parking is to be allowed in adjacent business lots.

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3. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The Contractor shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 14 13

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SECTION 01 25 13 - PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This document describes the requirements for submission of product information and procedures for consideration of substitutions by Owner, including products proposed to be used by Contractor under "or equal" or "acceptable alternate" provisions.

B. Where equipment, materials or process have been specifically named, it is the intention of the Engineer to use these items. If a Contractor desires to have an alternate considered, they are to provide the following information. It will be the responsibility of the Contractor to convince the Engineer that the alternate materials are equal and will perform the intended function at or above that of the specified equipment. The burden of proof is on the Contractor to convince the Engineer that the product is equal for the purpose of a particular function.

C. Substitution or Alternative Product Options: The alternative materials shall be submitted to Engineer no less than 5 business days before the bid opening. Engineer shall evaluate the materials, and if Engineer approves the substitution, an addendum shall be issued allowing the equipment alternatives.

1.2 DEFINITIONS

A. The word “Products,” as used herein, is defined to include purchased items form incorporation into the work, regardless of whether specifically purchased for the project or taken from Contractor’s stock of previously purchased products. The word “Materials,” is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word “Equipment” is defined as products with operation parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including “specialties”, “system”, “structure”, “finishes”, “accessories”, “furnishings”, “special construction”, and similar items, which are self-explanatory and have recognized meanings in the construction industry.

B. Neither “Products” nor “Materials” nor “Equipment” includes machinery and equipment used for preparation, fabrication, conveying and erection of the Goods.

1.3 CONTRACTOR’S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

B. For products specified by naming several products or manufacturers, select any product and manufacturer named.

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C. For products specified by naming one or more products but indicating the option of selecting equivalent products by stating "or equal" or "acceptable alternate" after specified product, Contractor must submit request, as required for substitution, for any product not specifically named.

1. “Or-Equal” Items: if in the Engineer’s sole judgment an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by the Engineer as an “or-equal” item, in which case review and approval of the proposed item may in the Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purpose of the paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. It is at least equal in quality, durability, appearance, strength and design characteristics.

b. It will reliably perform at least equally well the function imposed by the design concept of the complete project as a functioning whole;

c. There is no increase in cost to the Owner, and

d. It will conform to the detailed requirements of the item named in the Contract Documents.

D. For products specified by name, brand, model, etc., the Contractor shall provide information as required below for the Engineer to review and determine under their sole discretion that the product is acceptable.

1.4 SUBSTITUTIONS

A. If in the Engineer’s sole judgment an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, it will be considered a proposed substitute item and subject to the review process.

B. If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall first make written application to the Engineer for review of a proposed substitute item of material or equipment. The application shall certify that the proposed substitute will perform the function adequately and achieve the results called for by the general design, be similar in substance to the specified and be suited to the same use that is specified.

1. Wherever a proposed substitution item has not been submitted by the deadlines specified above, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the Engineer, the Contractor shall provide the material or equipment indicated in the Contract Documents.

2. The Engineer will evaluate each proposed substitution within a reasonable period of time.

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3. No substitution item be ordered, installed, or utilized without the Engineer's prior written acceptance of the Contractor's request.

4. The Engineer will record the time required by the Engineer in evaluating substitutions proposed by the Contractor and in making changes by the Contractor in Contract Documents occasioned thereby.

5. Contractor shall submit sufficient information as provided below to allow the Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and therefore an acceptable substitute. Requests for review of proposed substitute items of materials or equipment will not be accepted by the Engineer from anyone other than the Contractor. Include the following minimum information in the application:

6. The Contractor shall certify that the proposed substitution will perform adequately the functions and achieve the results called for by the general design and be similar and of equal substance to that indicated and be suited to the same use as the specified.

7. For products:

    a. Product identification, including manufacturer's name and address.

    b. Manufacturer's literature:

        1) Product description

        2) Performance and test data

        3) Reference standards

8. Samples.

9. Name and address of similar projects on which product was used and date of installation.

10. All variations of the proposed substitute item for the specified shall be identified in the application and available engineering, sales, maintenance, repair and replacement service shall be indicated.

11. The application shall state the extent, if any, to which the use of the proposed substitute will prejudice Contractor's achievement of delivery on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provision of any other direct contract with Owner for work on the project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the substitute in connection with the work is subject to payment of any license fee or royalty.

12. Relation to separate contracts.

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13. The application shall also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other sellers affected by any resulting change, all of which will be considered by the Engineer in evaluating the proposed substitute item.

C. In making request for substitution, Contractor shall:

1. Investigate proposed product or method and determine that it is equal or superior in all respects to that specified.

2. Provide the same guarantee for substitution as for product or method specified.

3. Coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.

4. Waive all claims for additional costs related to substitution which consequently become apparent.

5. Ensure cost data is complete and includes all related costs under this contract, but excludes:

a. Costs under separate contracts

b. Engineer's redesign

D. Substitutions will not be considered if:

1. No formal request is submitted.

2. Acceptance will require substantial revision of work.

E. Contractor shall provide all data in support of any proposed substitute or “or-equal” at Contractor’s expense.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 25 13

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SECTION 01 29 00 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Measurement and payment will be made as specified in this Section and in accordance with the provisions of the General Conditions.

B. The Contractor is alerted to the provisions of Section 01 32 16 regarding payment provisions for Construction Progress Schedule.

C. The Contractor is alerted to the provisions of Section 01 71 13 regarding payment provisions for Mobilization.

D. The Contractor is alerted to the provisions of Section 01 78 23 regarding payment provisions as it relates to the Owner's Manual submittal.

1.2 SCHEDULE OF VALUES

A. The Contractor shall prepare and submit a detailed Schedule of Values to the Engineer within 10 days from the effective date of the Contract. The detailed Schedule of Values shall be based on the values listed in the Bid Schedule. Because the ultimate requirement is to develop a detailed Schedule of Values, sufficient detailed breakdown shall be provided to meet this requirement. The Engineer shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the Engineer, a greater number of Schedule of Values items than proposed by the Contractor is necessary, the Contractor shall add the additional items so identified by the Engineer.

B. The minimum detail of breakdown of the major Work components is indicated.

1. Mobilization and demobilization 2% of contract time - no breakdown required.

2. Construction schedule.

3. Civil site Work shall be broken down into individual drainage piping, drainage structures, site concrete, paving, excavation cut and fill, removal of existing pipe, clearing and grubbing, demolition, and any other items determined to be necessary for the establishment of pay items.

4. Concrete structures shall be broken down into excavation, subgrade preparation, and appurtenant prefoundation Work, concrete foundation construction, slabs on grade, etc.; hydrostatic structure testing; and backfill.

5. Protective Coating Work shall be broken down by structure area and yard. Where specific coating Work at structure areas or yard may be critical to performing the Work to meet milestone and Contract dates, such Work shall be included as individual pay items.

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6. Mechanical Work shall be broken down to identify individual piping systems, equipment installation by equipment name and number, and equipment testing and checkout.

7. The electrical Work shall be broken down by yard facilities and structures. Yard facilities shall be broken down by duct bank designation and substations. Structures electrical Work shall be broken down into conduit and raceway installation, cable and wire installation, electrical equipment installation, terminations and lighting.

8. Instrumentation and control Work.

9. All other Work not specifically included in the above items shall be broken down as necessary for establishment of pay items.

C. The Contractor and Engineer shall meet and jointly review the detailed Schedule of Values within 35 days from the date of Notice to Proceed. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the Contractor and a revised detailed Schedule of Values shall be submitted within 40 days from the date of Notice to Proceed. Schedule of Values must be finalized and accepted prior to submitting first Application for Payment.

1.3 CHANGES TO SCHEDULE OF VALUES

A. Changes to the schedule of values shall be made to reflect Owner approved change orders.

B. In the event that the Contractor and Engineer agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values.

1.4 TECHNICAL MANUAL SUBMITTAL

A. Potentially up to two percent of the Contract Price will be retained from any monies due the Contactor, if at the 75 percent construction completion point, technical manuals have not been submitted as required by Section 01 78 23 – Operation and Maintenance Data.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 29 00

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SECTION 01 31 19 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall attend all Project meetings. Contractor's representative shall include Supervisor or Superintendent and shall have the required authority to commit the Contractor to solutions agreed upon. Other Contractor and subcontractor representatives may attend Project meetings as desired.

B. Contractor shall provide all pertinent Work-related reports or documents for each meeting as requested by the Owner.

C. Engineer will record minutes of all meetings and will furnish one (1) copy to the Contractor. Recipients of copies may make and distribute such other copies as they wish.

D. Contractor shall advise the Engineer of any inaccuracies, discrepancies, objections, or missing items in the minutes within five (5) calendar days of receipt of the minutes.

1.2 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference will be convened to designate responsible personnel, discuss scheduling, shop drawing procedures, pay applications processing, project supervision, coordination, progress reports, payrolls, labor provisions, and to establish a working understanding among the parties as to the Work. The Contractor will be responsible for having subcontractors and major suppliers necessary represented at the preconstruction meeting.

B. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the Contractor prior to the meeting date. However, the Contractor should be prepared to discuss all of the items listed below.

1. Status of Contractor's insurance and bonds.

2. Issuance of Notice to Proceed

3. Contractor's tentative schedules.

4. Transmittal, review, and distribution of Contractor's submittals.

5. Processing applications for payment.

6. Maintaining record documents.

7. Critical work sequencing.

8. Field decisions and Change Orders.

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9. Use of Site, office and storage areas, security, housekeeping, and Owner's needs.

10. Major equipment deliveries and priorities.

11. Contractor's assignments for safety and first aid.

12. Daily Report Form.

13. Submittal Transmittal Form which the Engineer will furnish.

C. Unless previously submitted to the Engineer, the Contractor shall bring to the conference one copy each of the following:

1. A preliminary schedule of Shop Drawings and samples.

2. A list of all permits and licenses the Contractor shall obtain indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.

3. A preliminary schedule of values in accordance with the bid schedule.

4. A 60-day plan of operation in accordance with Section 01 32 16 – Construction Progress Schedule.

5. Procurement schedule of major equipment and materials and items requiring long-lead time.

D. The Engineer will preside at the preconstruction conference and will arrange for keeping and distributing the minutes to the Owner and Contractor.

E. The Contractor and its subcontractors should plan on the conference taking no more than 1 full working day.

1.3 PROGRESS MEETINGS

A. The Engineer will arrange and chair approximately biweekly progress meetings. These meetings will be held at the City Hall (123 Lake St, Sandpoint, ID 83864)throughout the course of construction. The Contractor is to ensure that an authorized representative, having authority to act for and on behalf of the Contractor and having full knowledge of the Work and the contract schedule attend the meetings.

B. Representatives of the Contractor's suppliers and subcontractors, and parties providing services for the same, may attend the meeting if the Contractor elects to invite them to assist the Contractor's representatives at the meetings.

C. Attendees responsible to relay agenda items to Engineer at least 24 hours prior to meeting.

D. Suggested Agenda

1. Review of Work progress

2. Field observations, problems, and conflicts

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3. Problems that impede construction schedules

4. Review of off-site fabrication and delivery schedules

5. Corrective measure and procedures to regain projected schedules

6. Revisions to construction schedules

7. Plan progress schedules during succeeding work period

8. Coordination of schedules

9. Review submittal schedules, field orders, change orders, RFIs, and pay applications; expedite as required

10. Maintenance of quality standards

11. Review proposed changes for effect on construction schedules and on completion dates

12. Other business

1.4 OTHER MEETINGS

A. Other meetings will be held from time to time as may be requested by the Owner or Contractor. Time and place of meeting shall be as mutually agreed upon. Those required to be in attendance at meetings shall be as requested.

B. Other meetings shall also include meetings with regulatory agencies. When requested, the Contractor shall attend meetings held or required by governmental regulatory agencies having jurisdiction of the Work.

C. Other meetings also include Post-Construction Conference. The Post-Construction Conference will be held prior to initial acceptance of the Work to discuss and resolve all unsettled matters.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 31 19

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Scheduling of the Work shall be performed by the Contractor in accordance with the requirements of this Section. The purpose of the Construction Schedule is to allow the Contractor to prepare an orderly plan to aid in the timely completion of the project.

B. Development of the schedule and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling.

C. The approved Construction Schedule shall be used to plan and execute the Work, to measure the progress of the Work, and to aid in evaluating time extensions.

D. Failure to maintain the Construction Schedule in an approved status may result in the Owner withholding a monetary penalty against the responsible Contractor(s) until the schedule is approved as set forth in 3.4 of this Section.

PART 2 - PRODUCTS

2.1 CONSTRUCTION SCHEDULE

A. Prepare a detailed construction schedule in graphic form showing duration and proposed dates of starting and completing each major division of the Work. The schedule is to be consistent with the time and order of Work requirements of the specifications, and is to be the basis of the Contractor’s operations. Prepare the schedule utilizing a Gantt chart (bar type) or similar method that connects related activities.

B. Sufficient detail shall be included for the identification of subdivisions of the major components listed below. The major components should be broken in into activities such as demolition, site work, yard piping, excavation, foundation subgrade preparation, foundation concrete, completion of all structural concrete, pump/equipment, mechanical and plumbing installation, electrical power and controls, coatings, and other activities as required.

1. City Beach Lift Station

2. Superior Street Lift Station

C. Submit a horizontal bar chart with separate line for each section of Work, identifying first work day of each week.

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration. Clearly indicate critical path and activities/items on the critical path.

E. Indicate estimated percentage of completion for each item of Work at each submission.

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F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates.

PART 3 - EXECUTION

3.1 INITIAL SCHEDULE SUBMITTAL

A. The Contractor shall submit two short-term schedule documents at the Pre-construction Conference which shall serve as the Contractor's Plan of Operation for the initial 60-day period of the Contract Time, and to identify the manner in which the Contractor intends to complete all Work within the Contract Time.

B. The bar chart shall show the accomplishment of the Contractor's early activities (mobilization, permits, submittals necessary for early material and equipment procurement, and long lead, CPM submittals, initial site work and other submittals and activities required in the first 60 days).

C. Following the Contractor’s receipt of the Engineer’s review comments, the Contractor shall correct the schedule to identify missing activities and relationships relevant to the Scope of Work. No time extensions will be granted to complete activities not initially included in the Contractor’s Construction Schedule.

D. To the extent that there are any conflicts between the approved Construction Schedule and the requirements of the Contract Documents, the Contract Documents shall govern.

3.2 FINAL CONSTRUCTION SCHEDULE SUBMISSION

A. The Final Construction Schedule shall be submitted for approval within 60 calendar days after Notice to Proceed is issued. It shall provide a reasonable level of detail and a reasonable sequence of activities which represent Work through the entire project.

B. The Construction Schedule shall show the sequence and interdependence of activities required for complete performance of the Work, beginning with Contractor’s receipt of the Notice to Proceed and concluding with the date of Final Completion of the Contract. The Project Schedule shall show all activities in workdays, with allowance for holidays and the effects of normal weather conditions on outside work.

C. The Construction Schedule shall comply with all limits imposed by the Scope of Work, with all contractually specified intermediate milestones and completion dates, and with all constraints, restraints, or sequences included in the Contract.

D. Procurement Activities: Prepare the schedule in chronological order of submittals. Show specification section of the submittal, name of contractor and generic description of work covered. Include activities to cover the complete procurement process to include but not limited to: submittal, review, approval, resubmittal, procurement, fabrication, delivery, permits, and similar pre-construction work.

E. Manpower:

1. All activities shall have an estimate of the average number of workers per day that are expected to be used during the execution of the activity.

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2. Identification of any manpower, material or equipment restrictions, as well as any activity requiring unusual shift work, such as two (2) shifts per day, six (6) day work week, specified overtime, or work at times other than regular days or hours, shall clearly be identified in the Project Schedule.

3. Critical or near Critical Paths resulting from the use of manpower or equipment restraints shall be kept to a minimum. (Near Critical Paths are defined as paths having 10 workdays or less of total float.)

F. Responsibility: All activities shall be identified in the Construction Schedule by the party responsible to perform the Work. Responsibility includes, but is not limited to, the Contracting Firm, the Subcontracting Firm, Contractor Workforce, or Agency performing a given task. Activities shall not belong to more than one responsible party.

G. Work Areas:

1. Arrange the schedule to show each major area of construction for each major category or unit of Work.

2. All activities shall be identified in the Construction Schedule by the Work area in which the activity occurs. Activities shall not be allowed to cover more than one work area.

H. Modification or Claim Number: Any activity that is added or changed by a change order or used to justify any claimed time, shall be identified by change order code that changed the activity. Activities shall not belong to more than one change order.

I. Milestones: The Construction Schedule shall start no earlier than the date that the Notice to Proceed (NTP) was issued. Milestone dates are defined in calendar days following the date set forth in the Notice to Proceed and are required to be met by all Contractors. Time is of the essence for the completion of Milestones and for the Contract Completion date.

3.3 PERIODIC SCHEDULE UPDATES

A. Submit revised schedule with each Application for Payment, identifying changes since previous version.

B. Provide recommendations for adjusting the Construction Schedule to meet milestone completion and Contract completion dates (include why the schedule needs adjusting, i.e., change order, weather, contractor resources, etc.).

C. The Contractor shall prosecute the Work in accordance with the approved Construction Schedule. Out of sequence construction, defined as a change from the Construction Schedule in the Contractor’s actual operation, requires prior approval from the Engineer.

D. Upon the approval of a change order or the issuance of a unilateral change order by the Owner the agreed-upon change order activities, activity durations, logic and impacts shall be reflected in the next schedule submittal by the Contractor.

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3.4 PAYMENT FOR CPM SCHEDULES

A. The Contractor's attention is directed to the condition that 2% of the total Contract Price will be deducted from any money due the Contractor as progress payments until the Original CPM Schedule Submittal listed above has been completed as specified. The aforementioned amount will be retained by the Owner as agreed, estimated value of completing the original schedule. Any such retention of money for failure to complete all such mobilization items as a lump-sum item shall be in addition to the retention of any payments due to the Contractor as specified in the General Conditions of the Contract.

B. Approval of subsequent monthly pay requests may be delayed unless accompanied by a copy of the monthly update to the CPM schedule as described above. Extensive delays in submission of the monthly update may constitute sufficient basis for the Engineer to recommend withholding of some or all of any payment.

END OF SECTION 01 32 16

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SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the Engineer as delineated in this Section.

B. At the Pre-Construction Conference, the Contractor shall submit the following items to the Engineer for review:

1. A preliminary construction schedule.

2. A preliminary schedule of Shop Drawings and Samples.

C. Contractor to submit project related documents, including RFIs and Submittals, via email, internet based construction management software package, or similar, as agreed upon by Engineer. Access to documentation to be provided at no cost to the Engineer and Owner

1.2 ENGINEER'S REVIEW PERIOD

A. For planning purposes, the Contractor shall assume a minimum of 14 days for review by the Engineer following receipt of submittal/resubmittal. If an expedited review is requested by the Contractor, the submittal shall identify the requested expedited review. The Engineer will attempt to accommodate the expedited review.

1.3 SUBMITTAL PROCEDURES

A. Verify that the material or equipment described in each submittal conforms to all requirements of the Specifications and drawings. Where the detailed specifications require specific submittal data, submit all data at the same time. The submittals are to be accompanied by the transmittal form attached at the end of this Section. The Engineer will return for resubmittal any information not accompanied by the specified transmittal form, properly completed.

B. Indiscriminate submittal of only manufacturer's literature is unacceptable and will be rejected.

C. The submittals shall be numbered as XXXXXX-YY-z., where XXXXXX is the specification section number, YY is the sequential number of the submittal, and Z is used for re-submittal labeled a through z. For example, the first submittal of an item from Section 32 13 13 – Concrete for Exterior Improvements would be numbered "32 13 13-01"; the first re-submittal of the submittal would be numbered "32 13 13-01-A".

D. A separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be rejected. A multiple page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Engineer.

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E. Identify Project, Contractor, subcontractor or supplier, pertinent Drawing sheet and detail number(s), and specifications section number, as appropriate.

F. All Contractor shop drawings submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submission to the Engineer. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.

G. Do not mark the submittals in red. Ensure that any marks are duplicated on all copies submitted. Outline the marks on reproducible transparencies in a rectangular box.

H. Coordinate submission of related items.

I. Identify variations from Contract Documents and product or system limitation which may be detrimental to successful performance of the completed Work.

J. Provide space for Contractor and Engineer Review stamps.

K. Submit electronic submittals to:
c/o Kyle Meschko, PE
601 Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
kmeschko@Kellerassociates.com

L. Submit material samples to:
c/o Kyle Meschko, PE
601 Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814
kmeschko@Kellerassociates.com

M. Electronic submittals:

1. Electronic submittals shall be submitted in PDF format and combined into a single file.

2. Engineer will return comments only.

3. Contractor is responsible for distributing copies of the submittal and Engineer's comments to concerned parties.

4. Engineer may require hard copies in lieu of an electronic submittal if, in the opinion of the Engineer, the electronic submittal is difficult to read.

N. Revise and resubmit submittals, as required, identifying all changes made since previous submittals.

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O. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.4 DEVIATIONS FROM CONTRACT

A. If the Contractor proposes to provide material or equipment which does not conform to all of the Specifications and Drawings, the transmittal form accompanying the submittal copies shall indicate under "comments" the deviations.

1.5 SHOP DRAWINGS

A. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, list, graphs, catalog sheets, data sheets, and similar items. Whenever the Contractor is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the project is to be built, unless otherwise directed.

B. Except as may otherwise be indicated herein, the Engineer will return submittal to the Contractor with comments. The Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item.

C. If submittal is returned to the Contractor marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.

D. If submittal is returned to the Contractor marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required.

E. If submittal is returned to the Contractor marked "AMEND-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.

F. If submittal is returned to the Contractor marked "REJECTED-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of, said revised submittal to the Engineer.

G. Fabrication of an item shall be commenced only after the Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN" or “MAKE CORRECTIONS NOTED". Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.

1.6 ORGANIZATION

A. A single submittal transmittal form shall be used for each technical specification section or item or class of material or equipment for which a submittal is required. A single submittal covering multiple sections will not be acceptable, unless the primary specification references other sections for components.

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B. On the transmittal form, index the components of the submittal and insert tabs in the submittal to match the components. Relate the submittal components to specification paragraph and subparagraph, drawing number, detail number, schedule title, room number, or building names, as applicable.

C. Unless indicated otherwise, terminology and equipment names and numbers used in submittals shall match those used in the Contract Documents.

1.7 EFFECT OF ACCEPTANCE OF CONTRACTOR INFORMATION

A. Acceptance by the Engineer of any drawings, method of work, or any information regarding materials or equipment the Contractor proposes to provide shall not relieve the Contractor of their responsibility for any errors therein and shall not be regarded as an assumption of risk or liability by the Engineer or Owner, or by any officer or employees thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure or inefficiency of any plan or method of work or material or equipment so accepted. Such acceptance shall be considered to mean merely that the Engineer has no objection to the Contractor using, upon their own full responsibility, the plan or method of work proposed, or providing the materials or equipment proposed.

B. Approval of shop drawings by the Engineer is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the Plans and Specifications. The Contractor is responsible for dimensions which shall be confirmed and correlated at the job site, fabrication process and techniques of construction, coordination of their work with that of all other trades and the satisfactory performance of their work.

1.8 PRODUCT DATA AND SAMPLES

A. Where required in the Specifications and as determined by the Engineer, test specimens or samples of materials, appliances and fittings to be used or offered for use in connection with the Work shall be submitted to the Engineer at the Contractor's expense. Specimen or sample submittals shall be made with information as to their sources, with all cartage charges prepaid, and in such quantities and sizes as may be required for proper examination and tests to establish the quality or equality thereof, as applicable.

B. All samples and test specimens are to be submitted in ample time to enable the Engineer to make any tests or examinations necessary, without delay to the Work. The Contractor will be held responsible for any loss of time due to the neglect or failure to deliver the required samples to the Engineer as specified.

C. Samples are also to be taken during the course of the Work, as required by the Engineer.

D. Laboratory tests and examinations that the Owner elects to make will be made at no cost to the Contractor, except that, if a sample of any material or equipment proposed for use by the Contractor fails to meet the Specifications, the cost of testing subsequent samples will be borne by the Contractor.

E. All tests required by the Specifications to be performed by an independent laboratory are to be made, and the samples therefore furnished shall be at the sole expense of the Contractor.

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F. Material used in the Work is to conform to the submitted samples and test certificates as approved by the Engineer.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 33 00

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STANDARD SUBMITTAL FORM

Transmittal of Shop Drawing or Submittal

CONTRACTOR: <CONTRACTOR NAME>

Tracking No. XXXXXX

Item covered by this submittal

Refer to the following attachment(s) for a detailed description of the item.

Applicable specification section(s)

☐ First Submittal OR ☐ Resubmittal No. _____

☐ This item is as specified OR ☐ This item is a substitution/or equal

☐ Supplier/Subcontractor certifies:

- ☐ Conforms to contract
- ☐ Minor deviations as specifically noted
- ☐ Major deviations as specifically noted

Review Priority: ☐ 1 ☐ 2 ☐ 3

Due Date: XX-XX-XX (Engineer's standard review period is 14 days)

Notes to Engineer:

Date Received by Contractor: _____ Date Returned to Subcontractor/Supplier _____

Contractor Comments:

Deviations Specifically Noted

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SECTION 01 35 13 – SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 GENERAL

A. The existing wastewater lift station facilities must remain operational during construction. As a result, phasing and sequencing of work is critical. Contractor shall take measures to maintain the wastewater service at all times during construction.

B. Temporary pumping, piping, power, lighting, controls, instrumentation, alarms, security devices, and all required safety devices shall be provided by the Contractor whenever their work or interruption due to their work affects the existing flows, pumping, piping, power, lighting, controls, instrumentation, alarms, etc.

C. Critical events in the sequence of construction are described in this Section and shall be utilized by the Contractor as a guideline. The construction constraints presented do not include all items affecting the completion of the work but are intended to describe the sequence of critical events necessary to minimize disruption to the lift station operation. It shall be understood and agreed by the Contractor that the critical events described are not all inclusive and that additional items of work not described may be required to minimize disruption and ensure compliance. Deviation from or modification of these suggested sequences is permitted if techniques and methods known to the Contractor will result in reducing the disruption of the facility operation and is approved in advance by the Engineer.

D. The construction constraints described herein shall be incorporated into the Contractor's schedule as described in Section 01 32 16 – Construction Progress Schedule.

1.2 SUBMITTALS

A. A plan showing the size and location of the temporary facilities and piping shall be submitted to the Engineer at the same time as the outage plan required. All costs for design, provision, operation, and removal of temporary facilities and piping shall be the responsibility of the Contractor.

B. The request for any deviation shall be submitted as a shop drawing. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

C. Outage Plan Submittal Requirements

1. Modifications to existing facilities, the construction of new facilities, and the connection of new to existing facilities will require the temporary outage or bypass of facilities. In these cases, the Contractor's work shall be coordinated with the operation of the facilities in advance. In addition to the Construction Schedule under Section 01 32 16 – Construction Progress Schedule, the Contractor shall submit a Request for Shutdown and a detailed outage plan and time schedule for each construction activity which will require a wet well, pipeline, electrical circuit

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(other than lighting), control circuit, equipment, or other facilities to be removed from service.

2. The Request for Shutdown and outage plans shall be submitted to the Engineer for the Owner's review and acceptance a minimum of two weeks in advance of the time that such outages are required. The outage plans shall be coordinated with the construction schedule specified in Section 01 32 16 – Construction Progress Schedule and shall meet the restrictions and conditions specified in this section. The detailed plan shall describe the Contractor's method for maintaining service; the length of time required to complete said operation; any necessary temporary power, controls, instrumentation, or alarms required to maintain control, monitoring, and alarms for the facility; and the manpower and equipment, which the Contractor shall provide in order to ensure proper operation of associated treatment units.

3. In addition, the outage plan shall describe the Contractor's contingency plan that shall be initiated in the event that their temporary facilities fail, or it becomes apparent that the time constraints described in the approved Outage Plan cannot be met. The contingency plan shall conform to all specified outage requirements. All costs for preparing and implementing both the outage and contingency plans shall be borne by the Contractor.

1.3 OPERATION OF EXISTING FACILITIES

A. Operational functions or shutdown of the existing facility required to facilitate Contractor's operation will be done by the Owner’s personnel only.

B. The Owner’s operation and maintenance personnel will cooperate in every way that is practical in order to facilitate Contractor's operation. However, certain shutdown and connections may only be permissible at times other than normal working hours such as nights or weekends. No additional payment will be made to the Contractor for any night, weekend, or holiday work or overtime payments. Contractor shall be sensitive to Owner’s overhead due to overtime pay and may be responsible for compensation if excessive outages are required.

C. If it is necessary for the proper operation or maintenance of portions of the existing facility, the Owner may require the Contractor to reschedule an approved shutdown at no cost to the Owner. The Contractor shall then reschedule their operations so there shall be no conflict with necessary operations or maintenance of the plant. The Contractor shall, within two (2) working days, provide the Owner with revised Request for Shutdown and a plan for rescheduling of the work in accordance with the requirements of the Contractor's Schedule.

1.4 OUTAGE PLANS

A. The Contractor shall not begin an alteration until specific written permission has been granted by the Engineer in each case.

B. The Engineer will coordinate the Contractor's planned procedure with the Owner’s personnel. The Engineer has the authority to modify any proposed shutdown procedures if said work would adversely impact wastewater service.

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C. The Owner shall be notified in writing at least one week in advance of the required outage if the schedule for performing the work has changed or if revisions to the outage plan are required.

D. The Contractor shall provide written confirmation of the shutdown date and time two working days prior to the actual shutdown.

E. The making of connections to existing facilities or other operations that interfere with the operation of the existing equipment shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall be completed as quickly as possible and with as little delay as possible and shall proceed continuously (24 hours a day and seven days a week), if necessary to complete modifications and/or connections in the minimum time.

F. Any temporary facilities and night, weekend, or holiday work and overtime payments required during process interruptions shall be included in the bid price for the work.

1.5 CONSTRAINTS AND WORK SEQUENCE

A. The Contractor shall be responsible for development of the construction sequencing. To the greatest extent possible, the Contractor shall maintain the existing facilities in service until new facilities are constructed and are operational to supplement the existing capacity. When new facilities are operational, the existing facilities may be taken out of service. The following general guidelines shall be used by the Contractor in planning the sequence of construction.

B. The following general information and guidelines shall be used by the Contractor in planning the sequence of construction. The list is not comprehensive, and items are not necessarily listed sequentially:

1. Permits. Contractor shall obtain all necessary permits.

2. Storm Water Pollution Prevention Plan (SWPPP). Submit Notice of Intent (NOI) and implement SWPPP measures to control storm water runoff, erosion, and discharge from construction dewatering efforts. The Contractor shall be responsible for management of storm water and sediment control measures in accordance with Section 01 57 12 – Construction Site Discharge.

3. Groundwater. Groundwater is anticipated near the surface, requiring significant dewatering efforts (see Geotechnical Engineering Evaluation, included as an appendix to Plans and Specifications).

4. Undocumented Fill. Undocumented fill is anticipated to be encountered at both lift station sites (see Geotechnical Engineering Evaluation). Undocumented fill at the City Beach Lift Station may not be reused as backfill. Undocumented fill at the Superior Street Lift Station site may be reused as backfill only if it meets the requirements of the Specifications.

5. Demolition. Demolition shall take place phases in order to maintain conveyance of wastewater throughout construction.

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6. Electrical. All new equipment will be powered via feeders from the new electrical service.

7. Natural Gas. New generators shall receive fuel from new natural gas service.

1.6 ELECTRICAL POWER/NATURAL GAS/INTEGRATION REQUIREMENTS

A. Contractor responsible for all permitting, coordinating, furnishing, and installation of power and natural gas, as required by Avista Utilities and the Project, to create a functional and operational system.

B. Owner has obtained system integrator that will be responsible for equipment and instrumentation as indicated in the plans, see G-006. City integrator will also be responsible for all lift station integration.

C. All switching, safety tagging, etc., required for plant facility shutdown or to isolate existing equipment shall be performed by the Contractor. In no case shall the Contractor begin any work in, on, or adjacent to existing equipment without written authorization by the Engineer.

D. The Contractor shall make all modifications or alterations to existing electrical facilities required to successfully install and integrate the new electrical equipment as indicated. Modifications to existing equipment, panels, or cabinets shall be made in a professional manner with all coatings repaired to match existing. The costs for modifications to existing electrical facilities required for a complete and operating system shall be included in the Contractor's original bid amount and no additional payment for this Work will be authorized.

E. Extreme caution shall be exercised by the Contractor in digging trenches in order not to damage existing underground utilities. Cost of repairs of damages caused during construction shall be the Contractor's responsibility without any additional compensation from the Owner.

F. The Contractor shall be responsible for identifying available existing circuit breakers in lighting panels for the intended use as required by the Drawings. Costs for this Work shall be included in the Contractor's original bid amount.

G. The Contractor shall visit the Site before submitting a bid to better acquaint itself with the Work of this Contract. Lack of knowledge will not be accepted as a reason for granting extra compensation to perform the Work.

1.7 TRAFFIC CONTROL

A. Shoring of excavations adjacent to the roadway may be necessary. Concrete barriers or similar are anticipated to protect traffic from the excavation. Contractor is responsible for protection of adjacent roadway and pedestrian traffic.

B. Construction traffic control shall adhere to the requirements of ISPWC Section 1103. The Contractor shall provide a traffic control plan and obtain an access permit to work within right-of-way. No work shall commence until a permit is issued and all approved traffic

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control is in place. The Contractor will ultimately be responsible for developing an acceptable plan.

1. Traffic control plan shall be prepared by certified TCS or PE in the state of Idaho.

C. Contractor shall coordinate all traffic control plans in the right-of-way with the City. Contractor shall receive approval and submit approval from the City to the Engineer prior to mobilization onto the right-of-way.

1.8 ROAD ACCESS

A. The project site may be congested and the Contractor shall conduct their operations to minimize interference with others as specified in Section 01 14 13 – Access to Site. Access roads and circulation roads shall not be closed unless equivalent road access is provided and maintained.

B. The project site entrance shall remain clear so vehicles can pull into the project site and to allow normal activities at the existing facility.

C. One lane of Beach Street shall remain open at all time. Construction in roadway is only permitted October through May.

D. Public access to the City Beach and adjacent park areas is to be maintained at all times.

E. Contractor to complete final paving within two weeks of asphalt removal.

F. Contractor to maintain access to RV park and electric vehicle charging station, adjacent to the City Beach Lift Station site.

1.9 OPERATIONS AND MAINTENANCE ACCESS

A. Owner’s operations personnel must have continuous safe access to all process control equipment.

1.10 SITE SECURITY

A. Install 6-foot tall chain-link fence around each site perimeter during construction to prevent public access.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Temporary facilities and piping shall be located to minimize interference with Contractor's construction facilities and Owner's operation and maintenance of the facility. Unless otherwise specified, each temporary pipeline shall be of the same size as its connection to the existing or permanent facility at the downstream end of the pipeline with respect to the

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liquid or gas flow in the pipeline. Piping materials shall be suitable for the material being conveyed and be as specified in their respective specification sections.

B. When temporary electrical power supply controls, instrumentation or alarms are required for routine continuous operations of existing or new equipment, the Contractor shall provide the necessary equipment and appurtenances for such temporary power supply controls, instrumentation or alarms. Prior to installing said equipment and appurtenances Contractor shall provide a submittal on the proposed components and installation for Engineer's review and approval.

C. During all rehabilitation, modification and demolition work, safe working conditions for the Owner's and Contractor's personnel shall be maintained at all times. The foregoing includes, but is not limited to, proper trench excavation, the provision of temporary equipment guards, supports, warning signs, walkways, covers over openings, handrailing and protection of electrical equipment and power supply. All temporary facilities shall be constructed in accordance with applicable codes and regulations so that they operate safely and properly. Valves to be temporarily shut off during the work shall be tagged as such and shall be wired shut with a crimped lead seal and padlocked. Electrical and mechanical equipment shall be similarly shut down.

3.2 CONSTRUCTION SEQUENCING - GENERAL

A. A proposed sequence of construction summary and description follows. Contractor shall perform all of the Work per Contractor's schedule. Contractor shall maintain operability of existing wastewater service at all time. Owner shall operate existing pumping facilities.

3.3 PROPOSED SEQUENCE OF CONSTRUCTION

A. City Beach Lift Station

1. Prior to beginning work at the site, Contractor to pothole and field verify locations of all existing valves, fittings, and tie in points for buried piping. Provide marked up drawing of sheet C-101-A showing field verified locations. Submit to Owner and Engineer for review prior to proceeding with work.

2. Install new wet well, valve vault, and associated lift station equipment and instrumentation; generator and on-site natural gas line from Avista Utilities meter assembly; and local control panel and motor control panel.

3. Install discharge pressure sewer line.

4. Complete precast concrete structure and pipe leakage testing for the lift station and discharge pressure sewer line. Conduct six-hour clean water testing for the lift station to confirm pump and associated equipment operation prior to tie in with existing system. Demonstrate to the satisfaction of the Owner that all equipment meets specified performance criteria, is properly anchored and installed, and operates smoothly. Provide water, temporary piping, and pumping as necessary to conduct the test.

5. Intertie with existing system. Operate valves to maintain functionality of existing City Beach Lift Station (new construction offline).

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a. Tie in to existing sewer line to be completed between the hours of midnight and 6:00 am. Coordinate this work with Owner to ensure proper notification and shutdown provisions.

6. Install new MH #1, MH #2, MH #3, and MH#4 and associated gravity sewer lines connecting them to the new wet well. Install new water service line. Complete precast concrete structure and pipe leakage testing.

a. Tie in to existing water and sewer lines to be completed between the hours of midnight and 6:00 am. Coordinate this work with Owner to ensure proper notification and shutdown provisions.

7. Operate valves at intertie to take existing City Beach Lift Station offline, and place new lift station into service. Complete start-up and testing activities.

8. Demolish existing lift station and associated piping and equipment, as indicated on Plans.

B. Superior Street Lift Station

1. Prior to beginning work at the site, Contractor to pothole and field verify locations of all existing tie in points for buried piping. Provide marked up drawing of sheet C-101-B showing field verified locations. Submit to Owner and Engineer for review.

2. Install new wet well, valve vault, and associated lift station equipment and instrumentation; generator and on-site natural gas line from Avista Utilities meter assembly; and local control panel and motor control panel.

3. Complete precast concrete structure and pipe leakage testing for the lift station. Conduct six-hour clean water testing for the lift station to confirm pump and associated equipment operation prior to tie in with existing system. Demonstrate to the satisfaction of the Owner that all equipment meets specified performance criteria, is properly anchored and installed, and operates smoothly. Provide water, temporary piping, and pumping as necessary to conduct the test.

4. Bypass pump from existing Superior Street Lift Station to existing pressure sewer line on site. Demolish portion of existing lift station pumps, valving, equipment, and structure necessary for bypass pumping. Submit bypass pumping plan for approval prior to beginning work.

5. Install new manhole and connection to new wet well. Install new pressure sewer discharge line from new lift station.

6. Install new 6” x 8” wye and connect to new manhole. Complete precast concrete structure and pipe leakage testing for gravity and pressure sewer improvements. Complete tie in of new lift station to existing pressure sewer line.

a. Tie in to existing sewer line to be completed between the hours of midnight and 6:00 am. Coordinate this work with Owner to ensure proper notification and shutdown provisions.

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7. Complete remaining demolition work.

END OF SECTION 01 35 13

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SECTION 01 35 53 – SECURITY PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall implement security procedures to ensure existing facilities and new construction are protected from vandalism, theft, and unauthorized entry. The Contractor shall:

1. Initiate security program in coordination with Owner's existing security system during mobilization.

2. Maintain program throughout construction period until Substantial Completion.

1.2 ENTRY CONTROL

A. The Contractor shall:

1. Restrict entry of persons and vehicles into construction areas.

2. Allow entry to construction area only to authorized persons with proper identification.

3. Keep all Contractor employees out of existing facilities that are not being modified under the Work.

4. Coordinate with Owner entry control to existing facilities that are not being modified under the Work.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 35 53

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SECTION 01 42 13 - ABBREVIATIONS AND ACRONYMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS

1.3 ACRONYMS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AlA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society

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ANSI	American National Standards Institute, Inc.
APA	American Plywood Association (or) American Parquet Association, Inc.
API	American Petroleum Institute
APWA	American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWCI	American Wire Cloth Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators
BHMA	Builders Hardware Manufacturer's Association
CBM	Certified Ballast Manufacturers
CDA	Copper Development Association
CEMA	Conveyors Equipment Manufacturer's Association
CGA	Compressed Gas Association

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CLFMI	Chain Link Fence Manufacturer's Institute
CLPCA	California Lathing and Plastering Contractors Association
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
DEQ	Department of Environmental Quality
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
DOE	Department of Ecology
DWR	Department of Water Resources
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
EPA	Environmental Protection Agency
FCI	Fluid Controls Institute
FM	Factory Mutual System
FPL	Forest Products Laboratory
HI	Hydronics Institute (or) Hydraulics Institute
HPMA	Hardwood Plywood Manufacturers Association
IAPMO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IFC	International Fire Code
IME	Institute of Makers of Explosives
IP	Institute of Petroleum (London)

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IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ISDSI	Insulated Steel Door Systems Institute
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ISPWC	Idaho Standards for Public Works Construction
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MIL	Military Standards (DoD)
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NAGDM	National Association of Garage Door Manufacturers
NB	National Board of Boiler and Pressure Vessel Inspectors (alternate NBBPVI)
NBS	National Bureau of Standards (Now NIST)
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association (or) National Fluid Power Association (or) National Forest Products Association
NISO	National Information Standards Organization
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NSF	National Sanitation Foundation

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NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PPI	Plastics Pipe Institute
RCRA	Resource Conservation and Recovery Act
RIS	Redwood Inspection Service
RMA	Rubber Manufacturers Association
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SDI	Steel Door Institute
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry, Inc.
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
TIA	Telecommunications Industries Association
UBC	Uniform Building Code

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UFC	Uniform Fire Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WEF	Water Environment Federation
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 42 13

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SECTION 01 42 19 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. Applicable Publications: Whenever Specification references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids shall apply. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists' Assignments: In certain instances, specification text requires specific work be assigned to specialists or expert entities who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. In addition, these requirements are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents:

1. References herein to "Building Code" shall mean 2018 International Building Code (IBC).

2. References to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean International Mechanical Code, Uniform Plumbing Code and International Fire Code of the International Conference of the Building Officials (ICBO).

3. "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA).

4. The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the Work is advertised for bids, as adopted by the

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agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

B. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or furnishing labor. The Contractor shall bid for the most stringent requirements.

C. The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.

D. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

E. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

F. Applicable Standard Specifications: References in the Contract Documents to "Standard Specifications" shall mean the Idaho Standards for Public Works Construction, latest Edition.

1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The Contractor shall be responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of - hazardous materials, including petroleum products.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 42 19

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SECTION 01 45 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Specific quality control requirements for the Work are indicated throughout the Contract Documents. The requirements of the Section are primarily related to performance of the Work beyond furnishing of manufactured products. The term “Quality Control” includes inspection, sampling and testing, and associated requirements.

B. The Work shall be inspected and tested according to the requirements stated in Article 14 of the General Conditions and as amended by the Supplementary Conditions.

1.2 SUBMITTALS

A. Submit testing results in accordance with Section 01 33 00 – Submittal Procedures.

B. For Engineer and Owner approval, the Contractor shall submit testing laboratory’s qualifications and certifications prior to entering into a contractual agreement to perform quality control testing and inspection work.

C. Reports of testing will be submitted to the Engineer indicating observations and results in test and indicating compliance or non-compliance with Contract Documents. It is the responsibility of the Contractor to ensure these submittals are provided in a timely manner to reduce cost impact of potential removal of defective work.

1.3 SAMPLING AND TESTING

A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current ASTM standards, as applicable to the class and nature of the article or materials considered; however, the Owner reserves the right to use any generally-accepted system of inspection which, in the opinion of the Engineer will ensure the Owner that the quality of the workmanship is in full accord with the specifications.

B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the specifications.

C. Notwithstanding the existence of such waiver, the Engineer shall reserve the right to make independent investigations and tests as specified in Subparagraph 1.3.D, following; and, upon failure of any portion of the Work to meet any of the qualitative requirements of the specifications, shall be reasonable cause for the Engineer to require the removal or correction and reconstruction of any such work.

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D. In addition to any other inspection or quality assurance provisions that may be specified, the Engineer shall have the right to independently select, test, and analyze, at the expense of the Owner, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed; provided, that wherever any portion of the work is discovered, as a result of such independent testing or investigation by the Engineer, which fails to meet the requirements of the specifications, all cost of such independent inspection and investigation, and all costs of removal, corrections, and reconstruction or repair of any such work shall be borne by the Contractor.

1.4 TESTING SERVICES

A. The Contractor shall hire an independent testing lab to perform quality control tests as specified in each specification. All tests shall be paid for by the Contractor.

Item	Reference for testing requirements
Earthwork	See Section 31 00 00 – Earthwork
Trench Backfill	See Section 31 23 33 – Trenching and Backfilling
Asphalt Pavement	See Section 32 12 16 – Asphalt Paving
Cast-in-Place Concrete	See Section 03 30 00 – Cast-in-Place-Concrete
Grout	See Section 03 30 00 – Cast-in-Place-Concrete

B. Testing company shall meet the following qualifications:

1. Basic requirements of ASTM E329, “Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials as Used in Construction” and ASTM D3666, “Standard Specification for Minimum Requirements for Agency Testing and Inspecting Bituminous Paving Materials”, as applicable.

2. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

C. The Contractor shall notify Engineer 24 hour prior to the expected time for operations requiring inspection and laboratory test services. Failure of the Contractor to notify the Engineer at least 24 hours in advance of any such inspections shall be reasonable cause for the Engineer to order a sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective work required, and all costs of such delays, including its effect upon other portions of the Work, shall be borne by the Contractor.

D. Samples and test specimens required under these specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests and analysis before said articles or materials are to be used. The Contractor shall furnish and prepare all required test specimens at their own expense.

E. Should any tests fail the specified requirements, the work shall be redone and retested at the Contractor’s expense.

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1.5 REGULATORY REQUIREMENTS

A. General

1. Comply with all Federal, State, and local Codes as referenced herein. Such regulations apply to activities including, but not limited to, sitework and zoning, building practices and quality, on and offsite disposal, safety, sanitation, nuisance, and environmental quality.

2. Contractor designed structural systems are subject to the same overall inspection requirements as all other work.

B. Special Inspection

1. Special Inspection is in addition to, but not replacing, other inspections and quality control requirements herein.

2. Contractor will contract with and pay for the services of an independent Special Inspection Agency. Contractor shall coordinate with the designated Special Inspector to schedule the timing of site visits to perform the inspections in a timely manner.

3. A schedule of required Special Inspections is provided in Section 01 45 33 – Special Inspection, Observation, and Testing.

C. Structural Observation

1. Inspect framework, shoring, pipe supports, and other Contractor-designed systems for adequacy.

2. Engineer will provide structural observation in addition to the inspection performed by the Special Inspection Agency.

1.6 RIGHT OF REJECTION

A. The Engineer may reject portions of the Work as provided in Article 14 of the General Conditions.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection: The Contractor shall inspect materials or equipment upon their arrival on the job site and immediately prior to installation and reject damaged and defective items.

B. Measurements: The Contractor shall verify measurements and dimensions of the work as an integral step of starting each installation.

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C. Manufacturer's Instructions: Where installation includes manufactured products, the Contractor shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

3.2 SITE INVESTIGATION AND CONTROL

A. Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work due to their failure to comply with this requirement.

B. Contractor shall inspect related and appurtenant work and shall report in writing to the Engineer any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair or replacement caused by unsuitable conditions shall be performed by the Contractor at their sole cost and expense.

END OF SECTION 01 45 00

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SCHEDULE OF SPECIAL INSPECTIONS (PLAN)			
PROJECT	**Lift Station Replacements**		
2018 IBC REFERENCE AND MATERIAL *I* ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**
1704.2.5 Inspection of Fabricators		Y	
Verify fabrication/quality control procedures	In-plant review (3)	Y	Periodic
1705.1.1 Special Cases			
Work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements	Submittal review, shop (3) and/or field inspection	Y	Post Installed Anchors: As required by submitted ICC ESR Report or if specifically called out on plans.
1705.3 Concrete Construction		Y	
1. Inspection reinforcement, including prestressing tendons, and verify placement (ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3)	Shop (3) and field inspection	Y	Periodic
3. Inspection of anchors cast in concrete (ACI 318: 17.8.2)	Shop (3) and field inspection	Y	Periodic
4. Inspection of anchors and reinforcing steel post-installed in hardened concrete: a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. b. Mechanical anchors and adhesive anchors not defined in 4.a.	Field inspection	a. Y b. Y	a. Continuous b. Periodic
5. Verify use of approved design mix	Shop (3) and field inspection	Y	
6. Fresh concrete sampling, perform slump and air content tests and determine temperature of concrete	Shop (3) and field inspection	Y	
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Y	
8. Inspection for maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Y	

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SCHEDULE OF SPECIAL INSPECTIONS (PLAN)			
PROJECT	**Lift Station Replacements**		
2018 IBC REFERENCE AND MATERIAL *I* ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**
9. Inspection of pre-stressed concrete for (ACI 318: 26.10): a. Application of prestressing forces; and b. Grouting of bonded prestressing tendons.	Shop (3) and field inspection	a. Y b. Y	a. Continuous b. Periodic
10. Inspect erection of precast concrete members (ACI 318: 26.9).	Field Inspection	Y	Periodic
1705.6 Soils		Y	
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic
3. Perform classification and testing of controlled fill materials.	Field inspection	Y	Periodic
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic

Notes:

1. *The qualifications* of *the Special Inspector(s) and/or testing agencies may be subject to the approval* of *the Building Official and/or the Design Professional and shall be qualified person(s) from an independent testing agency.*
2. *The list* of *Special Inspectors may be submitted* as a *separate document, if noted* so *above.*
3. *Special Inspections* as *required by Section 1704.2.5 are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.2*
4. *Observe on* a *random basis, operations need not be delayed pending these inspections. Perform these tasks for each welded joint, bolted connection, or steel element.*
5. *NOT* of *welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N7.*

END OF SECTION 01 45 33

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall be responsible to provide all equipment including that required for office, sanitation, signage, lighting, etc., as per requirements in paragraph in Section 00 72 13 – General Conditions.

1.2 SAFETY

A. The Contractor shall comply with "Safety and Protection" requirements as described in Section 00 72 13 – General Conditions.

B. Appropriate first aid facilities and supplies shall be kept and maintained by the Contractor at the site of the work. All persons within the construction area shall be required to wear protective helmets and eye protection. In addition, all employees of the Contractor and their subcontractors shall be provided with, and required to use, personal protective and life saving equipment as set forth in "Subpart E" of the OSHA Safety and Health Standards for Construction (29CFR 1926) including all of its amendments.

C. During the performance of the Work, the Contractor shall erect and maintain temporary railings and barriers and shall take all other necessary precautions and place proper guards for the prevention of accidents and the Contractor shall erect and maintain suitable and sufficient lights and other signals.

1.3 TEMPORARY UTILITIES

A. Types: The types of utility services required for general temporary use at the Site include the following:

1. Water service (potable for certain uses, including fire protection)
2. Storm sewer
3. Sanitary sewer
4. Electric power service
5. Telephone service
6. Gas service

B. Scheduled Uses: The Contractor shall, in conjunction with establishment of job progress schedule, establish a schedule for implementation and termination of service for each temporary utility at the earliest feasible time, and when acceptable to Owner and Engineer, change over from use of temporary utility service to permanent service.

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1.4 TEMPORARY FACILITIES

A. Contractor shall obtain all necessary permits, arrange for connection of utilities, and pay all required fees and utility costs associated with the work site during the construction activities.

B. Suitable areas for on-site materials storage shall be maintained by Contractor as specified in Section 01 14 13 – Access to Site. Locations of storage areas shall be subject to Owner's approval, but shall remain the responsibility of the Contractor. Location shall not interfere with drainage, traffic, or private property.

C. Contractor shall set up and maintain in a neat and orderly manner all temporary construction facilities. Locations shall be subject to Owner's approval but shall remain the responsibility of the Contractor.

1.5 CULTURAL RESOURCES

A. The Contractor's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called cultural resources.).

B. The Contractor shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.

C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:

1. The Engineer will issue a Field Order directing the Contractor to cease all construction operations at the location of such potential cultural resources find.

2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the Engineer.

D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the Idaho State Historical Society, the Contractor shall suspend work at the location of the find under the provisions for changes contained in Section 00 72 00 – General Conditions.

1.6 DUST ABATEMENT

A. The Contractor shall prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from dust originating from its operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility by the Engineer.

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1.7 RUBBISH CONTROL

A. During the progress of the Work, the Contractor shall keep the Site and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.8 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in Section 01 57 12 - Construction Site Discharge.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The Contractor shall provide either new or used materials and equipment, which are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry, by compliance with appropriate standards, as being suitable for intended use in each case. Where a portion of temporary utility is provided by utility company, the Contractor shall provide the remaining portion with matching and compatible materials and equipment and shall comply with recommendations of utility company.

PART 3 - EXECUTION

3.1 INSTALLATION OF TEMPORARY UTILITY SERVICES

A. Wherever feasible, the Contractor shall engage the utility company to install temporary service to project, or as a minimum, to make connection to existing utility service; locate services where they will not interfere with total project construction Work, including installation of permanent utility services; and maintain temporary services as installed for required period of use; and relocate, modify or extend as necessary from time to time during that period as required to accommodate total project construction Work.

B. Temporary connections for electricity shall be subject to approval of the Engineer and the power company representative and shall be removed in like manner at the Contractor's expense prior to final acceptance of the Work.

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C. Separation of Circuits: Unless otherwise permitted by the Engineer, circuits used for power purposes shall be separate from lighting circuits.

D. Construction Wiring: Wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. Electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

3.2 INSTALLATION OF POWER DISTRIBUTION SYSTEM

A. Power: The Contractor shall provide power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the Work in a safe and satisfactory manner.

B. Temporary Power Distribution: The Contractor shall provide a weatherproof, grounded, temporary power distribution system sufficient for performance of entire Work of project, including temporary electrical heating where indicated, operation of test equipment and test operation of building equipment and systems which cannot be delayed until permanent power connections are operable, temporary operation of other temporary facilities, including permanent equipment and systems which must be placed in operation prior to use of permanent power connections (pumps, HVAC equipment, elevators, and similar equipment), and power for temporary operation of existing facilities (if any) at the Site during change-over to new permanent power system.

1. Provide circuits of adequate size and proper power characteristics for each use;

2. Run circuit wiring generally overhead, and rise vertically in locations where It will be least exposed to possible damage from construction operations and will result in minimal interference with performance of the Work;

3. Provide rigid steel conduit or equivalent raceways for wiring which must be exposed on grade, floors, decks, or other exposures to damage or abuse.

3.3 WATER SUPPLY

A. The Contractor shall coordinate with the Utility they are obtaining water service connection from. The Contractor shall provide all facilities necessary to convey the water from the source to the points of use in accordance with the requirements of the Contract Documents; this includes back flow prevention in accordance with the Utilities requirements.

B. The Contractor shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the water supply system. Water used for domestic purposes shall be free of contamination and shall conform to the requirements of the State and local authorities for potable water. The Contractor shall be solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water there from.

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C. The Contractor shall not make connection to or draw water from any fire hydrant or pipeline without first obtaining permission of the Owner. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a valve, meter, and backflow prevention device acceptable to the Owner.

3.4 STORM WATER

A. All storm water runoff and control of soil erosion shall be managed as outlined in Specification Section 01 57 12 – Construction Site Discharge .

3.5 INSTALLATION OF SANITARY FACILITIES

A. Fixed or portable chemical toilets shall be provided wherever needed for the use of Contractor's employees. Toilets at construction job sites shall conform to the requirements of Subpart C Section 1926.51 of the OSHA Standards for Construction.

B. The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the Site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

C. The Contractor shall coordinate with the Owner for obtaining sewer connection and shall pay all permit and sewer usage charges. The sewer capacity charges will be paid by the Owner.

3.6 INSTALLATION OF COMMUNICATIONS

A. Telephone Services: The Contractor shall provide and maintain at all times during the progress of the Work not less than one telephone in good working order at its own field construction office at or near the Site.

B. Telephone Use: The Contractor shall permit the Engineer, the Owner, or their authorized representatives or employees free and unlimited use of said telephone facilities for all calls.

3.7 OPERATIONS AND TERMINATIONS

A. Prior to placing temporary utility services into use, the Contractor shall inspect and test each service and arrange for governing authorities' required inspection and tests and obtain required certifications and permits for use thereof.

B. The Contractor shall maintain distinct markers for underground lines and protect from damage during excavating operations.

C. When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, the Contractor shall promptly remove installation unless requested by Engineer to retain it for a longer period. The Contractor shall complete and restore Work which may have been delayed or affected by installation and use of temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

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D. Before final acceptance of the Work on the project, all temporary connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to original condition or better, to the satisfaction of the Engineer and to the Owner.

END OF SECTION 01 50 00

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SECTION 01 57 12 - CONSTRUCTION SITE DISCHARGE (SWPPP)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Construction activities that disturb one acre or more are regulated under the Idaho Pollutant Discharge Elimination System (IPDES) Regulations for Storm Water Discharges. The Idaho Department of Environmental Quality (IDEQ) has created a Construction General Permit (CGP) which outlines a set of provisions construction operators must follow to comply with the requirements of the IPDES storm water regulations.

B. The IPDES through the CGP governs the construction activities to prevent and control soil erosion, transport, sedimentation, and further water and air pollution that may degrade receiving waters including rivers, streams, lakes, reservoirs, groundwater and wetlands. The control measures contained herein shall be installed and maintained through the construction contract and coordinated with any permanent or temporary pollution control feature specified elsewhere on the plans and in the specifications to assure effective and continuous water pollution control throughout the construction and post construction periods. The controls may include silt fences, straw wattles, rock berms, diversion dikes, interceptor swales, sodding, mulching, soil retention blankets, or other structural or non-structural stormwater pollution controls. Any and all erosion control structures and stabilization practices will be inspected, maintained by the Contractor on a weekly basis, and after any storm event of 0.25 inches or greater. The Contractor will all keep a detailed record of inspections, maintenance and discharge events.

C. The Owner reserves the right to have required temporary erosion sedimentation and water pollution prevention and control work performed by others should the Contractor fail to perform required temporary erosion, sedimentation, and water pollution prevention and control work in a timely fashion or should the Contractor fail to prevent and control soil erosion, sedimentation, and water pollution which may degrade receiving water. All costs, including engineering, for the work required shall be borne by the Contractor.

1.2 REFERENCES

A. Agency Documents:

1. Construction General Permit and Related Documents: https://www.deq.idaho.gov/water-quality/wastewater/storm-water/

2. Catalog of Stormwater Best Management Practices for Idaho Cities and Counties: https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14968

3. Construction General Permit Resources, Tools, and Templates: https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates#swppp

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B. Other guidance documents:

1. Customizable SWPPP template for construction site operators in unauthorized states including Idaho. This SWPPP template is in Microsoft Word format: https://www.epa.gov/sites/production/files/2017-04/sw_cgp2017_swppptemplate-4-5-17.docx

1.3 SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPPP): Prior to submitting a Notice of Intent, the Contractor shall create and submit the SWPPP that details how the Contractor proposes to comply with CGP. The Contractor's SWPPP will be subject to review by the Engineer prior to commencement of Work.

B. Notice of Intent (NOI): Prior to commencement of any work, the Contractor shall submit an NOI with IDEQ. The NOI must be submitted through the E-Permitting System to the IDEQ at least 14 calendar days prior to commencing earthwork. An executed NOI from IDEQ shall be submitted to the Engineer prior to commencing work.

1. E-Permitting System website:

a. https://www2.deq.idaho.gov/water/IPDES/

C. Notice of Termination (NOT): Upon completion of all work, the Contractor shall submit a complete NOT with IDEQ through the E-Permitting System. The NOT shall be submitted to the Engineer.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. The Owner and Contractor shall be co-permittees of the General Construction Permit (CGP) and, as such, both are responsible for the implementation of the SWPPP. If the Contractor fails to prevent pollutants from leaving the construction site, the Owner shall have the right to take corrective measures and withhold monies from the Contractor for such cost incurred by the Owner for corrective actions.

1. Prior to the Owner withholding costs for corrective actions. The Owner or Engineer will notify the Contractor of pollutants leaving the site. The Contractor shall have 8 hours to take corrective actions.

2. If the Contractor fails to take corrective actions, within 8 hours of notification, to prevent the pollutants from leaving the site, the Owner may take corrective actions and all costs incurred by the Owner for the corrective actions shall be withheld from payments owed to the Contractor.

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B. A copy of the SWPPP, NOI and the IPDES Stormwater General Construction Permit shall be kept on site at all times.

C. Copies of the required site inspection reports shall be made as an appendix to the SWPPP.

D. All documents shall be maintained and available for public review anytime during the project including up to three years after substantial completion.

3.2 MAINTENANCE & INSPECTION PROCEDURES

A. Any and all erosion control structures and stabilization practices will be inspected by the Contractor on a weekly basis at a minimum and after any storm event of 0.25 inches or greater. During the winter when the ground is frozen and runoff is unlikely to occur, such inspections shall be conducted at least every two weeks.

1. The SWPPP shall be modified as necessary to include additional or modified Best Management Practices (BMPs) designed to correct problems identified. Revision to the SWPPP shall be made within 7 calendar days following any identified correction. Copies of the revised SWPPP shall be provided to the Owner and Engineer.

2. All areas that undergo temporary and final stabilization with seeding or sodding shall be inspected; areas that have lack of growth and bare spots shall be reseeded by the Contractor to ensure healthy growth.

3. All erosion control structures and stabilization practices shall be maintained in good working condition throughout the duration of the construction project.

4. Repair of the damage to any structural erosion control structure shall be completed by the Contractor within 24 hours of discovery of the damage.

5. In locations where silt fences or wattles are used around catch basins, trapped sediment shall be removed by the Contractor when one-third of the height of the silt fence or wattle is covered by sediment.

6. Hard surfaces shall be swept at the end of each day’s work.

7. If detention/retention ponds are employed, the depth of the detention/retention ponds shall be measured monthly by the Contractor and the depth shall be provided to the Owner within one day of measuring. The Contractor shall remove sediment buildup in the pond if the buildup begins to interfere with the proper operation of the pond. The detention/retention ponds shall be excavated to design profile depths and slopes at the end of the project, if sediment buildup has significantly altered the pond profile.

8. Excavated material from any detention/retention ponds or swales shall not be used as structural fill and shall be disposed of as spoil material, in a location selected by the Contractor and approved by the Engineer. Once placed, the excavated material shall be stabilized using one of the suggested BMPs listed in IDEQ's Catalog of Stormwater BMPs.

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3.3 CLEAN UP AND REMOVAL OF BMPS

A. After final stabilization, remove all temporary BMPs and dispose of off-site at no cost to the Owner.

B. After removal of temporary BMPs, sweep all sediment accumulated on project hard surfaces, including asphalt, sidewalks, and adjacent roadways.

END OF SECTION 01 57 12

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SECTION 01 71 13 - MOBILIZATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Mobilization consists of preparatory work and operations including, but not limited to those necessary for the movement of personnel, movement of equipment, temporary construction facilities, supplies and incidentals to the project site. Included is the establishment of all necessary offices, buildings, signs, utilities, acquisition of permits, preconstruction submittals, and all other work which must be performed and costs incurred prior to beginning work on the various items of the contract.

B. Mobilization shall include the following principal items:

1. Moving onto the site all Contractor's plant and equipment required for first month operations.

2. Providing all necessary temporary on-site utilities per Section 01 50 00 – Temporary Facilities and Controls.

3. Arranging for and erection of Contractor's work and storage yard in accordance with Section 01 14 13 – Access to Site.

4. Constructing and implementing security features and requirements complying with Section 01 35 53 – Security Procedures.

5. Installing proper stormwater pollution prevention measures as specified in the Stormwater Pollution Prevention Plan developed in accordance with Section 01 57 12 – Construction Site Discharge.

6. Obtaining all required permits and property insurance.

7. Having all OSHA required notices and establishment of safety programs.

8. Having the Contractor's superintendent at the job site full-time.

9. Submitting pre-construction submittals in accordance with Specification Section 01 33 00 -Submittal Procedures.

1.2 SITE AREA

A. The limits of the project site are as indicated on the Drawings.

B. Contractor shall provide and maintain all signing, barricades, fencing, drainage facilities, and other items as required to protect public and private property from damage caused by mobilization operations.

1.3 ACCESS

A. Refer to Section 01 14 13 – Access to Site.

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B. If construction access is required in addition to that shown on the Drawings, Contractor shall secure Owner's approval of all additional project entrances prior to construction. Contractor shall also obtain written approval from impacted landowner(s) if other than project owner.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 PAYMENT FOR MOBILIZATION

A. Allowable amounts for partial payment of mobilization are as follows:

1. First monthly progress estimate: Up to 60% of the Mobilization contract price in the agreed-upon Schedule of Values, or 6% of the total Contract Amount, whichever is less.

2. The balance of the Mobilization contract price in the agreed-upon Schedule of Values shall be paid after Substantial Completion.

3. The Contractor's attention is directed to the condition that 2 percent of the total Contract Price will be deducted from any money due the Contractor as progress payments until all mobilization items listed above have been completed as specified. The aforementioned amount will be retained by the Owner as the agreed estimated value of completing all of the mobilization items listed. Any such retention of money for failure to complete all such mobilization items as a lump-sum item shall be in addition to the retention of any payments due to the Contractor as specified in the Contract Documents.

END OF SECTION 01 71 13

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SECTION 01 71 23.16 - CONSTRUCTION SURVEYING

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall provide construction surveying for the project.

B. The Contractor shall hire a professional land surveyor to reset any disturbed survey monuments in accordance with Idaho Code.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. The electronic AutoCAD base maps used to create the drawings are available to the Contractor. In the event of a discrepancy between the stamped paper drawings and the electronic files, the stamped paper drawings shall govern. The Contractor shall immediately notify the Engineer of any discrepancies prior to proceeding. The Contractor shall indemnify and hold harmless the Owner and Engineer from all liability, claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the Contractor's use or interpretation of electronic files.

3.2 CONSTRUCTION STAKING

A. The Contractor shall provide location and grade construction surveying as required to locate the Work.

3.3 MONUMENTATION

A. The Contractor shall employ a professional land surveyor, duly and properly registered in the State of Idaho, to reference all public and private land survey monuments that will be disturbed by construction activities prior to construction. Reestablish such monuments as part of the survey work for this project before project completion in accordance with Idaho Code. Section corner and quarter corner monuments reset after construction shall include corner perpetuations and filing with the county. Sixteenth corner monuments reset and having existing corner perpetuation filed with the county shall have new perpetuation records filed after the corner has been reset. Perform all monument work in accordance with Title 55, Chapter 16 of the Idaho State Code. Perform all corner, property, and roadway centerline reestablishment in accordance with standard surveying practices under the responsible charge of a professional land surveyor.

END OF SECTION 01 71 23.16

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SECTION 01 71 33 - PROTECTION OF ADJACENT CONSTRUCTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. It shall be the Contractor's responsibility to ascertain the actual location of all existing utilities and other improvements indicated on the drawings and to see that such utilities or other improvements are adequately protected from damage due to all construction operations. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be directed by the Owner.

1.2 RIGHTS-OF-WAY

A. The Contractor shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure; nor shall the Contractor enter upon the rights-of-way involved until notified that the Owner has secured authority from the property owner.

1.3 EXISTING UTILITIES AND IMPROVEMENTS

A. The Contractor shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities, including underground utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements specified herein, and in accordance with the requirements of the Contract Documents.

B. The Contractor shall determine the exact locations and depths of all underground utilities indicated on the drawings.

C. The right is reserved to the Owner and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this contract.

D. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and back-filling and, if damaged, shall be immediately repaired by the Contractor at their expense.

E. In the event that the Contractor damages any existing utility lines that are not shown on the drawings or the locations of which are not made known to the Contractor prior to excavation, the Contractor shall refer to procedures of General Conditions.

F. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Owner a sufficient time in advance for the necessary measures to be taken to prevent interruption of the service.

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G. All repairs to a damaged improvement shall be inspected and approved by an authorized representative of the improvement owner before being concealed by backfill or other work.

H. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is shown on the drawings, the Contractor shall, at their own expense, remove and without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the Owner of the facility. In all cases of such temporary removal or relocations, restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 NOTIFICATION BY THE CONTRACTOR

A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more that 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

END OF SECTION 01 71 33

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SECTION 01 74 20 – GRAVITY PIPE TESTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required for pressure testing and flushing of gravity pipeline installations.

B. The Contractor shall be responsible for conveying test water from the Owner designated source to the point of usage and for disposal of water used in the testing operations.

C. The testing schedule shall be as shown on the pipe schedule included in the Drawings.

1.2 DEFINITIONS

A. Leakage: The quantity of water/air required to maintain the specified test pressure after the line has been filled with water or air.

1.3 REFERENCE STANDARDS

A. Most recent version of the International Mechanical Code

1.4 SUBMITTALS

A. Notify Engineer 48 hours in advance of test and submit outline of proposed testing procedure for approval in accordance with Section 01 33 00 – Submittal Procedures.

B. All test records shall be submitted to the Engineer. Include the following items in the test records:

1. Type of test
2. Identification of pipe system
3. Size and type of pipe
4. Length of pipe in test section
5. Test pressure and time
6. Date of test approval
7. Signature of test witness

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PART 2 - PRODUCTS

2.1 MATERIAL REQUIREMENTS

A. Temporary valves, plug, bulkheads, and other air pressure testing and water control equipment and materials shall be provided by the Contractor subject to the Engineer's review. No materials shall be used which would be injurious to pipeline structure and future function.

PART 3 - EXECUTION

3.1 GENERAL

A. Gravity sewer pipes and service laterals shall be tested for exfiltration or infiltration as indicated. Manholes and pipe shall be backfilled prior to testing. The maximum length of pipe tested shall be the 4 reaches between 5 manholes. Leakage test shall be completed and approved prior to placing of permanent resurfacing of pavement. When leakage or infiltration exceeds the allowable amount, the Contractor shall locate the leaks and make the necessary repairs or replacements to reduce the leakage or infiltration to the allowable limits. Individually detectable leaks shall be repaired, regardless of whether the test results are acceptable or not.

B. No materials shall be used which would be injurious to pipeline structure and future function. Air test gauges shall be laboratory-calibrated test gauges, and if required by the Engineer, shall be recalibrated by a certified laboratory prior to the leakage test. Air test gauges shall have a size and pressure range appropriate for the pipe being tested.

C. Testing operations shall be performed in the presence of the Engineer.

D. Release of water from pipelines, after testing has been completed, shall be performed as reviewed by the Engineer.

E. Pipeline 30-inches diameter and larger shall be visually inspected after all debris has been removed prior to testing.

3.2 TESTING

A. Visual Inspection: Visually inspect the pipeline between manholes with mirrors or lights after each trench has been backfilled to check alignment and grade, and to check for pipe distortions, leaks, infiltrations, and other defects. Verify that a full diameter of pipe is visible from one manhole to the next. Uncover and repair leaks and defects in the pipeline. Do not reinstall damaged pipe. In lieu of visual inspection, a mandrel may be pulled through the pipeline.

B. Air Pressure Testing: Low pressure air test shall be used in pipelines that are 24 inches and smaller in diameter. Provide equipment including gauges and instrumentation and calibrate the equipment at the request of the Engineer.

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1. Preliminary and Final Testing: At the discretion of the Contractor preliminary testing may be done at any time prior to installation of other utilities. Perform final testing after backfilling and compaction and following installation of other utilities, but prior to surface restoration.

2. Test Procedure: Securely brace plugs to prevent unintentional release of the plug. Prohibit workers from entering a manhole where a plugged pipe is under pressure.

   a. Locate pressure gauges, valves and instrumentation required for the test and operation of the equipment at the ground surface.

   b. Equipment testing apparatus with a pressure release device such as a rupture disk or pressure relief valve to relieve pressure in the pipe being tested at 6 psi.

   c. Measure static groundwater depth above the pipe at the low end of the pipe. If static groundwater level is below the centerline of the pipe use the test pressures noted in this Section. If the groundwater is above the centerline, add 0.5 psi to the test pressure for every foot of groundwater above the centerline of the pipe. If pressure will exceed 6 psi, use hydrostatic exfiltration testing.

   d. Pressurize the pipe at 4.0 psi and maintain pipe pressure between 3.5 and 4.0 psi for at least 2 minutes.

   e. With the pressure at exactly 3.5 psi, disconnect the air supply, start a stopwatch and record the time for pressure to drop to 3.0 psi.

   f. If the pressure drops more than 0.5 psi in the pipe faster than the minimum holding time presented in the following table, make necessary corrections to reduce the leakage to acceptable limits and retest the pipe.

Time Holding Chart											
1 Pipe Diameter (in)	2 Min. Time (min:sec)	3 Length for Min. Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187L	4:43	4:43	4:57	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709L	5;40	5:40	5:42	7:08	8:33	9:58	11:24	12:60
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846L	3:30	3:30	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235L	9:55	9:55	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.537L	11:24	11:24	22:48	28:30	34:11	39:53	46:35	51:17

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C. Hydrostatic Exfiltration Testing.

1. Hydrostatic exfiltration shall be used to test pipes larger than 24 inches in diameter or test pipes 24 inches and smaller in diameter with groundwater conditions above pipe invert.

2. Test Procedure.

a. If necessary, fill pipe with clean water 24 hours prior to the test to allow time for absorption into the pipe walls.

b. Conduct exfiltration testing with a test pressure of at least 6 feet of water column above the static water table or the crown of the pipe at the upper end of the pipe, whichever is higher.

c. If exfiltration exceeds 0.16 gall on/hour/inch of inside diameter of pipe per 100 feet of sewer main, lateral, service line and stub-out, make the necessary corrections to reduce leakage to acceptable limits and retest the pipe. If manholes are included in the test section, increase the allowable leakage by 0.1 gallon/hour/foot of manhole depth tested.

d. Minimum test time is four hours.

3. Preliminary and Final Testing:

a. Preliminary Testing: At the discretion of the Contractor, preliminary testing may be done at any time prior to installation of other utilities.

b. Final Testing: Perform final testing after backfilling and compaction and following installation of other utilities but prior to surface restoration.

D. Large Diameter Pipeline Testing - Alternative to Hydrostatic Method

1. Upon approval of the Engineer, conduct low pressure air testing on pipes 27" through 60" per UNI-BELL Specification U NI-B-6-98. Refer to that specification for complete testing detail s.

a. Provide for all safety measures including, but not limited to:

1) Installation of adequate plug restraint to withstand testing forces with a conservative factor of safety. Necessary calculations and design of restraint system are to be performed by a licensed Idaho P E. Submit calculations for approval by the Engineer.

2) Provide a pressure relief valve on plug to release at a minimum pressure of 6 psig.

3) Do not allow personnel in manholes or near plugs during pressurization, testing, or depressurization.

4) Provide safety requirements of the plug manufacturer.

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5) Provide all other safety procedures deemed necessary.

b. Seal test pipe plugs at grade before use to ensure they hold at the maximum test pressure of 6 psig without bracing. Do not allow personnel within the alignment of the pipe ends during seal testing.

c. Prepare the line to be tested by cleaning the line, capping all service connections, and pre-wetting any lines that are made of porous pipe materials.

d. Inspect the joint at each manhole on the line to be tested to ensure its integrity prior to placing the pipe plugs, which will cover said joint.

e. Upon successful seal testing of the pipe plugs, place plugs in the line to be tested and brace the plugs. Place the upstream plug first to prevent upstream water collecting in the line.

f. Slowly inject low pressure air into the sealed line until the internal pressure reaches 4 psig greater than the average backpressure of any groundwater above the pipe invert, but not greater than 6 psig. The groundwater backpressure (measured in psig) is calculated by dividing the height of the groundwater above the pipe invert by 2.31.

g. After the target pressure is obtained, throttle the air supply to maintain that internal pressure for at least five minutes to stabilize temperatures.

h. Shut off the air supply and, prior to the reading decreasing below 3.5 psig, mark time with a stop watch, and observe the pressure gage. Acceptability of the pipe will be based on the time required for a 1.0 psig pressure drop per the following table. If the time shown on the table elapses prior to the pressure dropping 1.0 psig, the line is acceptable.

i. If the line fails the pressure test, make required repairs and re-test at no additional cost to the Contract.

j. Provide testing results in writing to the Engineer.

2. Upon approval of the Engineer, conduct low pressure air testing on pipes larger than 60" per ASTM C 1103: Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines. Refer to that specification for complete testing details.

a. Provide for all safety measures including, but not limited to:

1) Install a pressure relief valve on plug to release at a minimum pressure of 6 psig.

2) Do not allow personnel in manholes, pipe, or near plugs during pressurization, testing, or depressurization.

3) Provide safety requirement of the joint testing system manufacturer.

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4) Provide all other safety procedures deemed necessary.

b. Ensure testing apparatus is suitable for the application and has been tested to the anticipated application pressures and is fully restrained within the pipe.

c. Prepare the line by cleaning the joint to be tested and pre-wet the pipe if made of porous materials.

d. Conduct a joint-by-joint air test of the line.

1) Install joint testing apparatus.

2) Slowly inject low pressure air into the sealed line until the internal pressure reaches 3.5 psig greater than the average backpressure of any groundwater above the pipe invert, but not greater than 6 psig. The groundwater backpressure (measured in psig) is calculated by dividing the height of the groundwater above the pipe invert by 2.31.

3) Stabilize air pressure for a minimum of 5 minutes.

4) Turn off air supply and monitor pressure gage.

5) If pressure holds, or drops less than 1.0 psig in 5 seconds, the pipe joint passes.

6) If pipe joint fails, repair and retest at no additional cost to the Contract.

e. Conduct a joint-by-joint water test of the line.

1) Install joint testing apparatus.

2) Slowly inject water the sealed line until the internal pressure reaches 3.5 psig greater than the average backpressure of any groundwater above the pipe invert, but not greater than 6 psig. The groundwater backpressure (measured in psig) is calculated by dividing the height of the groundwater above the pipe invert by 2.31.

3) Turn off water supply and monitor pressure gage.

4) If pressure holds, or drops less than 1.0 psig in 5 seconds, the pipe joint passes.

5) If pipe joint fails, repair and retest at no additional cost to the Contract.

f. Provide testing results in writing to the Engineer.

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Specification Time Required for a 1.0 PSIG Pressure Drop for Size and Length of Pipe Indicated for Q = 0.0015*											
Pipe Dia. (in)	Min. Time (min:sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.883 L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	65:40	40	85.476 L	142:28	213:41	284:55	356:09	427:23	498:37	569:50	641:04

Note: If there has been no leakage (zero psig drop) after one hour of testing, the test section shall be accepted and the test complete. *Q is the allowable leakage rate in ft3/min/ft2 of inside surface area of pipe.

E. Pipe Cleaning: Prior to CCTV inspection, clean the completed pipeline with a hydro-cleaner, or other Engineer approved cleaning equipment, and provide a pipeline free of dirt, mud, rocks, or other material. Leave downstream plugs in place during cleaning and do not introduce foreign material into existing sewer lines. Closed Circuit Television (CCTV) Inspection.

F. Closed Circuit Television (CCTV) Inspection

1. Acceptance criteria

a. If standing water is observed due to grade defects, use the following table to determine allowable depth of standing water in relationship to the design slope of pipe.

Pipeline Slope (ft/ft)	Allowable Standing Water Depth (inches)
Grade < 0.10%	≤ 5/8”
0.10% ≤ Grade < 0.20%	≤ 1/2"
0.20% ≤ Grade < 0.40%	≤ 3/8”
0.40% ≤ Grade < 0.60%	≤ 1/4"
0.60% ≤ Grade < 0.80%	≤ 1/8”
Grade > 0.80%	No Standing Water

b. No pipeline structural defects observed.

c. No pipeline installation defects observed.

d. No infiltration observed.

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2. CCTV sewer line inspection to be performed by an experienced service approved by Engineer.

3. Ensure all manholes grout work is completed prior to CCTV to prevent pipe breakage at the pipe connection to the manhole.

4. Perform CCTV inspection after backfill and prior to surface repair. Uncover and reinstall sections of the pipe found to have defects in workmanship (including standing water caused by grade defects) as directed by the Owner. After repair re-CCTV the repaired section. Do not reinstall damaged or rejected pipe.

5. Notify Engineer at least 24 hours prior to CCTV inspection to allow for Engineer, at Engineer's discretion, to witness.

6. Clean lines prior to CCTV inspection using hydro cleaner, flushing balls or other suitable means acceptable to the Engineer. Remove debris from lines rather than washing them downstream.

7. Immediately prior to CCTV inspection, pour sufficient water/dye mixture in upstream manhole to produce visible flow in downstream manhole(s). Allow excess water to drain from pipe prior to commencing CCTV inspection.

8. Provide CCTV records in high quality DVD format unless otherwise directed by the Engineer.

   Provide CCTV sewer line inspection equipment including a color camera system, DVD recording system, camera propulsion equipment, and van to allow witness of CCTV by Engineer.

9. The DVD shall include the following video and audio information:

   a. Video

      1) Project Number and Name.

      2) Date of TV Inspection.

      3) Upstream and downstream manhole numbers.

      4) Current distance along line segment.

   b. Audio

      1) Date of TV Inspection

      2) Verbal confirmation of upstream and downstream manhole number and/or locations.

      3) Verbal description of pipe, size, type and pipe joint length.

      4) Verbal description of location of each service connection.

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c. Tape Identification Tag

1) Manhole to Manhole Designation.

10. If no defects are observed, submit DVD and logs to Engineer for review and acceptance.

END OF SECTION 01 74 20

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SECTION 01 74 30 - SITE PRESSURE PIPE TESTING AND DISINFECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall test all potable water pipelines, utility water, pressure sewer pipe and appurtenant piping, fittings, valves, and meters.

B. The Contractor shall be responsible for obtaining permits for discharging excess testing and disinfection water and dechlorination of such water if required to satisfy permit limits.

1.2 SUBMITTALS

A. The Contractor shall furnish the following information:

1. A testing plan and schedule, including method for conveyance, control, disposal, de-chlorination, and disinfection shall be submitted in writing for approval.

2. Name of certified bacteriological testing laboratory.

3. Provide to the Project Engineer a record of test duration calculations for each segment tested.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, and other water control equipment, and choice of disinfectant shall be as determined by the Contractor.

B. Chlorine for disinfection may be in one of the following forms:

1. Sodium hypochlorite liquid containing approximately 5 to 15% available chlorine, per ANSI/AWWA B 300.

2. Calcium hypochlorite, granular or in 5g tablets containing approximately 65% available chlorine by weight, per ANSI/AWWA B 301.

3. Liquid chlorine: Only with written authorization of Engineer, in accordance with the requirements of ANSI/AWWA B301 - Liquid Chlorine and only by trained personnel using appropriate safety practices.

C. Dechlorinate water prior to discharge. Dechlorination agents may be sodium bisulfite, calcium bisulfite, sodium sulfite, or sodium thiosulfate.

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PART 3 - EXECUTION

3.1 GENERAL

A. Water for testing pipelines will be furnished by the Owner; however, the Contractor shall convey the water from the Owner-designated source to the points of use.

B. All pressure pipelines shall be pressure tested; those for potable water shall be disinfected. All chlorinating and testing operations shall be performed in the presence of the Engineer.

C. Disposal of flushing water and water containing chlorine shall be by methods acceptable to the Idaho Department of Environmental Quality.

D. Disinfection operations shall be scheduled as late as possible during the Contract Time to maximize the degree of sterility of the facilities at the time the Work is accepted by the Owner. Bacteriological testing shall be performed by a certified testing laboratory and paid by the Contractor.

3.2 HYDROSTATIC TESTING OF PIPELINES

A. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. Flushing pipe velocity shall be 2.5 ft/second minimum.

B. The Contractor shall test pipelines either in sections or as a unit. No section of the pipeline shall be tested until the trench has been properly backfilled and all field-placed concrete or mortar has attained an age of 7 days, or until adequately cured. The test shall be made by closing valves when available or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test to avoid movement and damage to piping and equipment. Remove or protect any pipeline-mounted devices that may be damaged by the test pressure. The Contractor shall provide sufficient temporary tapping’s in the pipelines to allow for all entrapped air to exit. After completion of the tests, such taps shall be permanently plugged. Open all air relief valves during filling.

C. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the release valves at a reasonable velocity. All the air within the pipeline shall be allowed to escape. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling.

D. Verify that, in a minimum two-hour test, the pipe does not leak in excess of the allowable leakage as defined by the following formula in which L is the allowable leakage in gallons per hour.

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$$L = \frac{ND(P)^{1/2}}{7{,}400}$$

Where L = Allowable Leakage (gallons/hours)

N = Number of Joints in Tested Line - including fittings (number)

D = Nominal Pipe Diameter (inches)

P = Tested Pressure (psi, gauge)

E. For pipe working pressures less than or equal to 100 psi, sustain a test pressure of 150 psi. For pipe working pressures greater than 100 psi, sustain a test pressure at least 1.5 times the working pressure or as determined by the Engineer.

F. Pressure test pipe per ASTM F 2164-02 Field Leaking Testing of Polyethylene (PE) Pressure Piping Systems using Hydrostatic Pressure.

3.3 DISINFECTING PIPELINES – TABLET OR GRANULE METHOD

A. Solution Strength: 25 mg/L minimum.

B. Use: Only if the pipes and appurtenances are kept clean and dry during construction. Do not use on solvent welded plastic or screwed joint steel pipe.

C. Placement When Using Granules: During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-foot intervals.

D. Granular Quantity:

Ounces of Granules	
Pipe Diameter (inches)	Amount (ounces)
4	0.5
6	1.0
8	2.0
10	3.2
12	4.0
16	8.0
18	10.2
20	12.5
24	18.0

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E. Placement When Using Tablets: During construction, place 5g calcium hypochlorite tablets in each section of pipe as noted in Table 2, and also place one tablet in each hydrant, hydrant branch and other appurtenances. Attach tablets to the inside of the pipe using an adhesive such as Permatex No. 2 or approved substitution. Assure no adhesive is on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets at the inside top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, mark their position on the section so it can be readily determined that the pipe is installed with the tablets at the top.

Number of Tablets [1]	
Pipe Diameter (inches)	No. of 5g Tablets [2]
4	1
6	1
8	2
10	3
12	4
16	6
18	7
20	9
24	13

[1] Adjust for pipe length other than 18 feet.

[2] Based on 3.25g available chlorine per tablet.

F. Filling Procedure: When granule or tablet installation has been completed, fill the main with clean water at a velocity not exceeding 1 fps. Take precautions to assure that air pockets are eliminated. Leave this water in the pipe for at least 24 hours. If the water temperature is less than 41°F, leave the water in the pipe for at least 48 hours. Position valve so that the chlorine solution in the main being treated will not flow into water mains in active service.

3.4 DISINFECTING PIPELINES – CONTINUOUS FEED METHOD

A. Solution Strength: Dose at 25 mg/L for 4 hours

B. Residual: 10 mg/L at 24 hours.

C. Dosing Methods:

1. Liquid Chlorine: Solution feed vacuum-operated chlorinator in combination with a booster pump. Direct feed is not allowed.

2. Hypochlorite Solution: Chemical feed pump designed for feeding chlorine solutions.

3. Calcium Hypochlorite Granules: Refer to previous section.

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D. Filling Procedure: Use approved source to flow clean water at a constant, measured rate into the newly laid water main. Fill at a point not more than 10 feet downstream from the beginning of the new main. Measure concentration at regular intervals to ensure a 25 mg/L dose. Position valves so that the chlorine solution in the main being treated does not flow into water mains in active service. Do not stop chlorine application until the entire main is filled with chlorinated water. Retain the chlorinated water in the main for at least 4 hours, operating all valves and hydrants in the section treated. At the end of the 24-hour period, verify the treated water in all portions of the main has a residual of 10 mg/L free chlorine.

3.5 DISINFECTING PIPELINES – SLUG METHOD

A. Solution Strength: 100 mg/L.

B. Dosing Methods: Per Engineer's direction

C. Filling Procedure: Use approved source to flow clean water at a constant, measured rate into the newly laid water main. Fill at a point not more than 10 feet downstream from the beginning of the new main. Measure concentration at regular intervals to ensure 100 mg/L dose. Apply the chlorine continuously and for the time required to develop a solid column or "slug" of chlorinated water that will, expose all interior surfaces to a 100 mg/L for at least 3 hours. Measure the chlorine residual in the slug as it moves through the main. If at any time it drops below 50 mg/L, stop flow and relocate chlorination equipment at the head of the slug, and as flow is resumed, add chlorine to restore the free chlorine in the slug to not less than 100 mg/L. As the chlorinated water flows past fittings and valves, operate valves and hydrants to disinfect appurtenances and pipe branches.

3.6 DISINFECTING PIPELINES – FINAL FLUSHING

A. After the retention period, flush the chlorinated water from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that in the system, or is acceptable for domestic use.

B. Dispose of flushing water to a location approved by the Engineer.

3.7 DISINFECTING PIPELINES – BACTERIOLOGICAL TESTS

A. After final flushing and before the water main is placed in service, test samples collected from the main(s) for coliform bacteria. Take 2 samples from each location at least 24 hours apart.

B. If the initial disinfection fails to produce approved bacteriological samples, reflush and resample the main. If check samples show bacterial contamination, re-chlorinate the main until approved results are obtained.

3.8 DISINFECTING PIPELINES – SWABBING

A. If connections are not disinfected along with the newly installed main, swab or spray the interior of all pipe and fittings used in making the connections with a 1% hypochlorite solution before installation.

END OF SECTION 01 74 30

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Comply with requirements stated in conditions of the contract and in Specifications for administrative procedures in closing out the Work.

B. Furnish lien waivers, bond extensions, and other required data.

C. Satisfy conditions of the contract, fiscal provisions, legal submittals and additional administrative requirements.

1.2 SUBSTANTIAL COMPLETION

A. When substantially complete, the Contractor shall submit to the Owner:

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, Engineer will perform an inspection to determine the status of completion. If the Work is not deemed substantially complete, the following will occur:

1. Owner will promptly notify the Contractor in writing, giving the reasons therefore.

2. The Contractor shall remedy the deficiencies in the Work, and send a second written notice of Substantial Completion to the Owner.

3. Owner will request the Engineer to re-inspect the Work.

4. Once the Work is deemed substantially complete and after review and approval, the Engineer will execute and deliver to the Owner and the Contractor, the Certificate of Substantial Completion with a final list of items to be completed or corrected prior to release of final payment.

1.3 PROJECT RECORD DOCUMENTS

A. Maintain at Project site, available to Owner and Engineer, one copy of the Contract Documents, shop drawings and other submittals, in good order.

1. Mark and record field changes and detailed information contained in submittals and change orders.

2. Record actual depths, horizontal and vertical location of underground pipes, duct banks and other buried utilities. Reference dimensions to permanent surface features.

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3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.

4. Identify location of spare conduits including beginning, ending, and routing through pull boxes and manholes. Record spare conductors, including number and size, within spare conduits, and filled conduits.

5. Provide schedules, lists, layout drawings, and wiring diagrams.

6. Make annotations with erasable colored pencil conforming to the following color code:

   a. Additions - Red

   b. Deletions - Green

   c. Comments - Blue

   d. Dimensions - Graphite

7. Make all annotations on one set of drawings.

B. Maintain documents separate from those used for construction.

1. Label documents “RECORD DRAWINGS.”

C. Keep documents current.

1. Record required information at the time the material and equipment is installed and before permanently concealing.

2. During progress meetings, record documents will be reviewed to ascertain that changes have been recorded.

D. Submit record documents for review. Submittal shall be in accordance with Section 01 33 00 – Submittal Procedures.

1.4 FINAL SUBMITTALS

A. The Contractor, prior to requesting final payment, shall obtain and submit the following items to the Engineer for transmittal to the Owner:

1. Written guarantees, where required.

2. Technical manuals and instructions.

3. New permanent cylinders and key blanks for all locks.

4. Maintenance stock items; spare parts; special tools.

5. Completed record drawings.

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6. Bonds for roofing, maintenance, etc., as required.

7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.

8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

9. Letter from bonding company stating that bonds will be extended for one year after substantial completion.

B. Owner will prepare a final Change Order, reflecting approved adjustments to the contract sum which were not previously made by Change Orders.

1.5 FINAL CLEANUP

A. The Contractor shall promptly remove from the vicinity of the completed Work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the Work by the Owner will be withheld until the Contractor has satisfactorily performed the final cleanup of the Site.

1.6 MAINTENANCE AND GUARANTEE

A. The Contractor shall comply with the maintenance and guarantee requirements contained in the General Conditions.

B. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the Owner. If the Contractor fails to make such repairs or replacements promptly, the Owner reserves the right to do the Work and the Contractor and its surety shall be liable to the Owner for the cost thereof.

1.7 FINAL PAY ESTIMATE

A. Submit final pay estimate and supporting data to Owner.

B. Final estimates shall reflect all adjustments to the contract sum:

1. The original contract sum

2. Additions and deductions resulting from:

a. Previous Change Orders

b. Allowances

c. Unit prices

d. Deductions for uncorrected work

e. Penalties and bonuses

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f. Deductions for liquidated damages

3. Total contract sum, as adjusted

4. Previous payments

5. Sum remaining due

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 77 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall submit technical operation and maintenance information for each item of mechanical and electrical equipment in an organized manner in the Owner's Manual. It shall be written so that it can be used and understood by the Owner's operation and maintenance staff. The Owner's Manual information shall also be submitted in electronic format using a USB flash drive.

B. All manuals supplied to the Owner by suppliers of Owner-furnished equipment, shall be inserted into the Owner's Manual by the Contractor. The Contractor shall be responsible for providing all other information.

1.2 OWNER'S MANUAL

A. The Owner's Manual shall include the following for each item of mechanical and electrical equipment (as applicable):

1. Equipment Summary: A summary table shall include the equipment name and equipment number, the manufacturer's model number, serial number, and other nameplate information specific to the equipment provided.

2. Operational Procedures: Manufacturer-recommended procedures on the following shall be included:

   a. Installation

   b. Adjustment

   c. Startup

   d. Location of controls, special tools, equipment required, or related instrumentation needed for operation

   e. Operation procedures

   f. Load changes, calibration, shutdown

3. Troubleshooting, Disassembly, Reassembly

   a. Realignment

   b. Testing to determine performance efficiency

   c. Tabulation of proper settings for all pressure relief valves, low- and high-pressure switches, and other protection devices

   d. List of all electrical relay settings including alarm and contact settings

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4. Preventive Maintenance Procedures:

   a. Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component, and by leaving the equipment in place.

   b. Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.

5. Parts List and Drawings:

   a. Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.

   b. Drawings: Cross-sectional or exploded view drawings shall accompany the part list.

6. Wiring Diagrams: Include complete internal and connection wiring diagrams for electrical equipment items.

7. Shop Drawings: Include approved shop or fabrication drawings, complete with dimensions. Include performance curves for pumps furnished.

8. Safety: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.

9. Documentation: All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

10. Spare Parts: This part shall contain spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the Owner in inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the Owner in ordering. The Contractor shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents.

B. If manufacturer’s standard brochures and manuals are used to describe operating and maintenance procedures, modify such brochures and manuals **to reflect only the model or series of equipment used on this project and features provided**. Cross out neatly or remove extraneous material, or otherwise annotate or eliminate.

1.3 TRANSMITTAL PROCEDURE

A. Provide three (3) original paper copies and one (1) electronic copy in PDF format of all operating and maintenance information. For ease of identification, label each

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manufacturer's brochure and manual with the equipment name. Organize the information in 3-ring binders and use an indexing feature within the PDF submission, in numerical order, per specification section number. Include in the manuals a table of contents and tab sheets to permit easy location of desired information. Each binder shall include a cover sheet and spine label giving the project name, Engineer's project number, Contractor name and contact information, applicable subcontractor name and contact information, and supplier name and contact information.

B. The Contractor shall submit to the Engineer three identical Owner's Manuals a minimum of 90 calendar days prior to the scheduled startup of the equipment.

C. The Engineer will review the Owner's Manuals within 30 days following their receipt by the Engineer. The Contractor shall then make any corrections and changes noted and compile all the corrected Owner's Manuals for final submittal to the Engineer.

1.4 PAYMENT

A. Acceptable operating and maintenance information for the project must be delivered to the Engineer prior to the project being 75 percent complete or at least two weeks prior to startup of any equipment. Progress payments for work in excess of 80 percent completion or 2 weeks prior to startup will not be made until the specified acceptable operating and maintenance information has been delivered to the Engineer.

1.5 FIELD CHANGES

A. Following the acceptable installation and operation of an equipment item, the item's instructions and procedures are to be modified and supplemented to reflect any field changes or information requiring field data.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 78 23

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SECTION 02 41 00 – DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. Work under this Section includes providing selective demolition of part of the existing facilities shown on the drawing and as specified herein.

B. Work under this Section also includes EPA reporting, testing (unless previously provided to the Contractor), and disposal of structures containing asbestos. The EPA required reporting is required regardless of if asbestos is encountered or not.

C. Demolition work to occur within demolition limits denoted on Drawings, unless otherwise agreed upon by the Engineer and Contractor. Repairs to areas outside of designated demolition extent shall be replaced or reconstructed at no cost to the Owner.

1.2 CONDITION OF STRUCTURES

A. Owner assumes no responsibility for actual conditions of items or structures to be demolished. Conditions existing at time of commencement of contract will be the responsibility of the Contractor.

1.3 PROTECTION OF FACILITIES

A. Protect from damage existing finish work that is to remain in place that becomes exposed during demolition operations.

B. Protect adjacent areas with suitable coverings when necessary to prevent surface damage, including protecting existing concrete and asphalt surfaces from concrete staining.

C. Remove protections at completion of work.

1.4 ENVIRONMENTAL CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

1.5 ASBESTOS REQUIREMENTS

A. Completing the National Emission Standards for Hazardous Air Pollutants (NESHAP) sampling, testing, submitting the EPA notification and any other required submittals as incidental to the Work.

B. The project includes structures with a potential for asbestos containing material (materials other than metal, glass, or PVC plastic). Comply with the following regulations:

1. (NESHAP Regulations 40 CFR 61

2. Toxic Substances Control Act – Asbestos 40 CFR 763

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3. Asbestos Hazard Emergency Response Act (AHERA)

4. Relevant OSHA Standards

C. If asbestos is discovered in the course of the demolition Work that exceeds the threshold amounts as defined in NESHAP 40 CFR 61.145, comply with the requirements for asbestos containing materials in all of the above listed regulations and standards.

1.6 PERMITS

A. Obtain any permits for building, electrical, or plumbing demolition that may be required for the Work at no additional costs.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions of surrounding area that could be misconstrued as damage resulting from selective demolition work. Provide these photos to the Engineer prior to commencement of selective demolition work.

3.2 ASBESTOS SAMPLING, TESTING, HANDLING, SHIPPING, AND DISPOSAL

A. Prior to any demolition or renovation, have a National Emissions Standards for Hazardous Air Pollution (NESHAP), Asbestos Hazard Emergency Response Act (AHERA) or Environmental Protection Agency (EPA) certified inspector inspect and collect appropriate samples to determine the presence of Asbestos Containing Material (ACM) in the structure.

B. Have the collected samples analyzed at a certified asbestos analytical laboratory.

C. Generate and submit a copy of the inspection report to the Engineer.

D. If ACM is found and is below the threshold quantities as defined in NESHAP 40 CFR 61.145 Standard for Demolition and Renovation, or if ACM is not present on structures being renovated, complete the EPA Notification requirements below.

E. If ACM is found and was not previously identified in the Contract and is above the threshold quantity as defined in NESHAP 40 CFR 61.145 Standard for Demolition and Renovation, stop Work on the affected structure and notify the Owner and Engineer. Do not proceed with Work on the affected structure until a Change has been issued by the Owner.

3.3 EPA NOTIFICATION REQUIREMENTS

A. Regardless, if ACM is found or not, complete a Notification of Demolition/Renovation in writing and submit to the EPA at least 10 days prior to the start of demolition/renovation

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operations, as outlined in NESHAP 40 CFR 61.145. Use of the following form is recommended.

1. http://www.epa.gov/region10/pdf/asbestos/demolition-renovation-notification-form_fillable.pdf

B. Submit a copy of the notification to the Engineer for concurrence prior to the EPA submittal. Allow 10 working days for Engineer concurrence. Upon concurrence, submit notification to the EPA Region 10 office. At the following address:

Asbestos NESHAP Coordinator
U.S. Environmental Protection Agency
Region 10 Office of Compliance and Enforcement (OCE-101)
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

3.4 PREPARATION

A. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of adjacent facilities to remain.

B. Cease operations immediately if safety of structure or existing facility appears to be endangered. Take precautions to support structure/facilities until determination is made for continuing operations.

3.5 DEMOLITION

A. Demolish concrete flatwork only in areas shown on the drawings to be removed. However, the exact location may be adjusted in the field if required to avoid existing obstacles.

1. The line to be cut shall be marked on the surface along a string-line or straight edge with a marker that will not wash away from the action of the saw's cooling water. All cutting lines shall be marked along straight line prior to cutting.

2. Furnish and operate a power drive, self-propelled wheel mounted pavement sawing machine. The saw blade shall be either a wet cutting or dry cutting type. The depth of the saw shall be controlled by graduated positions set on the machine.

3. Concrete and asphalt slabs shall be cut by saw cutting the slab to full slab depth with one pass of the saw following exactly along the marked cutting line.

B. Where large power-driven saws cannot be operated close enough to the end of the slab to completely cut it (i.e. at an abutting wall or foundation) use power driven impact tools and grinders to remove the slab and form a smooth neat joint.

C. Where slab thicknesses exceed the maximum depth of the cutting machine, cut a line as deep as possible with the machine and use power driven impact tolls and grinders to remove the slab and form a smooth neat joint.

D. Remove all foundations shown to be removed. Do not bury unless authorized by the Engineer at the time of demolition.

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3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubble and other materials resulting from demolition work. Haul all materials from demolition to a disposal site obtained by the Contractor.

3.7 CLEANUP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment, and demolished materials from site.

3.8 REPAIR

A. Repair demolition performed in excess of that required. Return structures and surfaces to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02 41 00

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SECTION 03 11 00 – CONCRETE FORMING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required for forming cast-in-place concrete, including necessary anchorage.

B. Construct openings in formwork as required for other related work.

C. Provide and install all form accessories such as snap ties, bracing, etc.

D. Stripping of forms from finished concrete.

1.2 REFERENCE STANDARDS

A. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials

B. ACI 301 – Specifications for Structural Concrete

C. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

D. ACI 347R – Guide to Formwork for Concrete

E. PS 1 – Structural Plywood

1.3 SUBMITTALS

A. General: All submittals shall be submitted in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Submit concrete forming plans stamped by a professional engineer registered in Idaho for review for all forming where the height of the concrete work exceeds four feet.

1. Submit shoring and reshoring designs for all concrete work where shoring or reshoring is required.

2. Design and provide forms for pressure resulting from placement of concrete and construction loads while maintaining the specified tolerances.

3. Forming shall have sufficient strength to support loads, lateral pressure, and allowable stresses outlined in ACI 347R and for design considerations including wind load, temporary construction loads, and construction equipment loads.

C. Calculations: Submit concrete form design calculations stamped by a professional engineer registered in Idaho

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1.4 QUALITY ASSURANCE

A. Designer's Qualifications: Professional engineer, licensed in State where Work is to be done and having experience in concrete formwork. The Contractor is responsible for the design and adequacy of formwork and shoring.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

D. Comply with ACI 347R, ACI 301, and ACI 318.

2.2 MATERIALS

A. Smooth Forms: Pre-manufactured forms or job fabricated forms using plyform faced with material which will produce smooth, hard, uniform texture on concrete.

1. Arrange facing materials orderly and symmetrical, keeping number of seams to a practical minimum.

2. Do not use material with raised grain, patches, or other defects which will impair texture of concrete surfaces.

B. Forming accessories:

1. Use fabricated wire.

2. Use form ties constructed so that ends or end fasteners can be removed without causing appreciable spalling of concrete faces.

3. After ends or end fasteners of form ties have been removed, embedded portion of ties to terminate not less than two diameters from formed faces of concrete, but in no case less than 3/4-inch.

4. When formed face of concrete is not to be permanently exposed to view, form ties may be cut off flush with formed surfaces.

5. Use ties with 3/4-inch diameter cones and a 1-1/2-inch break back on both ends for water retaining structures. Ties are to be furnished with a water seal or stop.

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6. Snap ties, if used, shall not be broken until the concrete has reached the design concrete strength. Snap ties, designed so that the ends must be broken off before the forms can be removed, shall not be used. The use of tie wires as form ties will not be permitted. Fully threaded stub bolts may be used in lieu of smooth ties with waterstops.

7. Taper ties with plastic or rubber plugs of an approved and proven design may also be used. The plugs must be driven into the hole with a steel rod, placed in a cylindrical recess made for the plug. At no time shall plugs be driven on the flat area outside the cylindrical recess. Plugs shall be A58 Sure Plug as manufactured by Dayton Superior.

8. Form ties which remain in the corewall of water-retaining structures shall have waterstops and a one-inch minimum breakback or cone depth.

C. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

D. Fillets for Chamfered Corners: Wood or plastic strips attached to the inside of forms.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork. Ensure dimensions agree with the Drawings.

3.2 CONSTRUCTION

A. Make forms sufficiently tight to prevent loss of cement paste.

B. Place chamfer strips in corners of forms to produce beveled edges on permanently exposed surfaces.

1. Interior corners on such surfaces and edges of formed joints will not require beveling.

C. To maintain specified finish tolerances, chamfer formwork to compensate for anticipated deflections.

D. Provide positive means of adjustment using wedges or jacks, or shores and struts, and take up all settlement during concrete placing operation.

E. Securely brace forms against lateral deflection.

F. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

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G. At construction joints, overlap forms over hardened concrete at least 6 inches. Hold forms against hardened concrete to prevent offsets or loss of mortar at construction joint and to maintain true surface.

H. Provide runways for moving equipment with struts or legs, supported directly on formwork or structural member without resting on reinforcing steel.

I. Anchor formwork to shores or other supporting surfaces or members so that upward or lateral movement of any part of formwork system is prevented during concrete placement.

3.3 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for Work embedded in or passing through concrete.

B. Coordinate Work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb with templates where necessary. Ensure items are not disturbed during concrete placement.

D. Position embedded items accurately and support against displacement.

3.4 FORM FINISHES

A. Use smooth forms for natural plywood, grout cleaned, smooth rubbed, scrubbed, or sand floated finishes.

1. Fabricate true-to-line in order that surfaces produced will require little dressing to arrive at true surfaces.

2. Where an as-cast finish is required, no dressing shall be permitted in the finishing operation.

B. Install form panels in orderly arrangement with joints planned in approved relation to building elements.

3.5 FORM COATING

A. Unless otherwise specified or approved, treat surfaces of forms.

B. Cover surfaces of forms with form coating to aid in removal of forms with minimal damage to concrete.

3.6 REMOVAL OF FORMS

A. Formwork for columns, walls, sides of beams, and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal.

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B. Where no re-shoring is planned, leave forms and shoring used to support weight of concrete in beams, slabs, and other concrete members in place until concrete has attained its specified strength as determined by test cylinders.

C. Where reshoring is planned, supporting formwork may be removed when concrete has reached 70 percent of specified strength as determined by test cylinders, provided reshoring is installed immediately.

D. When shores and other vertical supports are so arranged that non-load carrying, form-facing material may be removed without loosening or disturbing shores and supports, facing material may be removed at an earlier age as permitted. Forms may not be removed prior to 24 hours after placement of concrete.

3.7 RESHORING

A. Design, engineering, and construction of reshoring is the responsibility of the Contractor.

B. While reshoring is under way, allow no live load on new construction.

C. During reshoring do not subject concrete in beam, slab, column, or any other structural member to combined dead and construction loads in excess of loads permitted by Engineer for developed concrete strength at time of reshoring.

D. Place reshores as soon as practicable after stripping operations are complete, but in no case later than end of working day on which stripping occurs.

E. Tighten reshores to carry required loads without over stressing.

F. Leave reshores in place until tests representative of concrete being supported have reached specified strength.

G. For floors supporting shores under newly placed concrete, level original supporting shore in place or reshore.

3.8 REUSE OF FORMS

A. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of surface.

B. Thoroughly clean and properly coat forms before reuse.

END OF SECTION 03 11 00

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SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and place reinforcing steel and reinforcing steel accessories in accordance with the drawings and as specified herein.

1.2 REFERENCE STANDARDS

A. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

B. ACI SP-66 – ACI Detailing Manual

C. ASTM A615 – Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

D. ASTM A706 – Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

E. ASTM A996 – Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

F. ASTM A1064 – Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

G. AWS D1.4 – Structural Welding Code – Reinforcing Steel

H. CRSI (DA4) – Manual of Standard Practice

1.3 SUBMITTALS

A. General: All submittals shall be submitted in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Indicate bar schedules, sizes, spacings, locations, and quantities of reinforcing steel, shapes of bent bars, wire fabric, bending and cutting schedules, splicing locations, stirrup spacing, supporting, and spacing devices.

C. Manufacturer’s Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Welder’s Certificates: Submit certifications for welders employed on the project, verifying AWS qualification withing the previous 12 months.

E. Reports: Submit certified copies of mill test report of supplied reinforcement materials analysis indicating physical and chemical analysis

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1.4 QUALITY ASSURANCE

A. Fabrication tolerances:

1.	Sheared length	± 1 inch
2.	Overall for stirrups, ties, and spirals	± 1/2 inch
3.	All other bends	± 1 inch

B. Placement tolerance:

1.	Spacing	1/4 inch
2.	Clear distance	+ 1/4 inch
3.	Lengthwise location	2 inches

C. Submit shop fabrication drawings of reinforcement prior to placing concrete.

D. Perform work of this section in accordance with ACI 315 and ACI 318.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code – Reinforcing Steel".

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish steel reinforcing bars of the type and grade as shown on the contract drawings conforming to the following steel reinforcing bars specifications. If bar type and grade are not shown on the drawings, furnish bars conforming to paragraph B below.

B. Reinforcing Steel Bars: ASTM A615, Grade 60 billet-steel deformed bars, uncoated as shown on the plans.

C. Welded Steel Wire Fabric: ASTM A1064 plain type; in flat sheets or coiled rolls uncoated finish as shown on the plans.

D. Low Alloy Reinforcing Steel Bars: ASTM A706, Grade 60 low alloy steel deformed bars, uncoated as shown on the plans.

E. Smooth dowel bars for construction joints: ASTM A29, Grade 60.

1. Where indicated, provide metal dowel cap at one end of dowel to permit longitudinal movement of dowel within concrete section.

2. Provide for movement which equals joint width plus one-half inch.

F. Corrosion Resistant Steel Bars: ASTM A1035-16b, Low Carbon Chromium Steel Reinforcing Bars.

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2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16-gauge annealed type.

B. Chairs, Bolster, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.3 FABRICATION

A. Fabricate reinforcement in accordance with ACI 315 and CRSI (DA4) – Manual of Standard Practice.

B. Locate reinforcing splices only where shown on the drawings. Indicate location of splices on shop drawings.

C. Weld reinforcing bars only where shown on the drawings. Furnish ASTM A706 reinforcing steel only where welding is required. Weld reinforcing bars in accordance with AWS D1.4.

PART 3 - EXECUTION

3.1 GENERAL

A. Clean reinforcement of loose or thick rust and mill scale, dirt, paint, oil, grease, earth, ice, and other foreign materials that would reduce bond to concrete.

B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

C. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.2 PLACING

A. Place all reinforcement in the exact position shown on the plans and approved shop drawings and secure in position during the placing and compacting of concrete. Wire bars together with No. 16 gauge wire with ties at all intersections except where spacing is less than 12 inches in each direction, in which case tie alternate intersections.

B. Maintain the distance from the forms and between layers of reinforcement by means of prefabricated chairs, precast mortar blocks, ties, hangers, or other approved devices. Placing and fastening of reinforcement in each section of the Work must be approved by the Engineer before any concrete is deposited in the section.

C. Do not tack weld reinforcing bars.

D. Overlap sheets of metal mesh 1 square plus 6 inches to maintain a uniform strength, and securely fasten at the ends and edges, and support to maintain clearances.

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E. Support reinforcing steel for formed floor slabs on metal chairs or slab bolsters. Size chairs or bolsters to position the steel in the exact location shown on the plans. Space chairs for supporting the top steel and bolsters for supporting the bottom steel not more than 5 feet on centers in each direction. Plastic coat the portion of the metal support in contact with the forms to prevent rust. Tie down deck steel to beams or forms at regular intervals of not more than 5 feet on centers along the beams to prevent movement of the steel during placing of the concrete.

3.3 SPLICING

A. Furnish all reinforcement in the full lengths indicated on the plans unless otherwise permitted. Splicing of bars, except where shown on the plans, not permitted without written approval from the Engineer. Stagger splices as far as possible.

B. Do not use lap splices on No. 14 and 18 bars.

C. Weld reinforcing steel only if detailed on the drawings

D. Do not bend reinforcement after embedding in hardened concrete.

E. Do not extend bars continuously through any expansion joint except expansion dowels.

3.4 FIELD QUALITIY CONTROL

A. An independent testing agency, as specified in the Section 01 45 00 – Quality Requirements, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION 03 20 00

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, and equipment required for the construction of cast-in-place concrete as shown on the drawings and as specified herein.

1.2 DEFINITIONS

A. Cold Weather: When ambient temperature is below 40 degrees Fahrenheit or is approaching 40 degrees Fahrenheit and falling.

B. Contractor's Licensed Design Engineer: Individual representing Contractor who is licensed to practice engineering as defined by statutory requirements of professional licensing laws in state or jurisdiction in which Project is to be constructed.

C. Defective Area: Surface defects that include honeycomb, rock pockets, indentations, and surface voids greater than 3/16-inch deep, surface voids greater than ¾-inch in diameter, cracks in liquid containment structures and below grade habitable spaces that are 0.005-inch wide and wider, and cracks in other structures that are 0.010-inch wide and wider, spalls, chips, embedded debris, sand streaks, mortar leakage from form joints, deviations in formed surface that exceed specified tolerances and include but are not limited to fins, form pop-outs, and other projections. At exposed concrete, defective areas also include texture irregularities, stains, and other color variations that cannot be removed by cleaning.

D. Exposed Concrete: Concrete surface that can be seen inside or outside of structure regardless of whether concrete is above water, dry at all times, or can be seen when structure is drained.

E. Hot Weather: As defined in ACI 305.1.

F. Hydraulic Structure: Liquid containment structure.

G. New Concrete: Less than 60 days old.

H. Slurry Mixture: Mixture of sand, 3/8-inch maximum nominal aggregate size, cement, and water for wall construction joints with waterstop.

1.3 REFERENCE SPECIFICATIONS

A. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

B. ACI 301 – Specifications for Structural Concrete

C. ACI 302.1R – Guide for Concrete Floor and Slab Construction

D. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete

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E. ACI 305R – Guide to Hot Weather Concreting

F. ACI 306R – Cold Weather Concreting

G. ACI 308R – Guide to Curing Concrete

H. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

I. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field

J. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

K. ASTM C94 – Specification for Ready-Mixed Concrete

L. ATM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch Cube Specimens)

M. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete

N. ASTM C150 – Specification for Portland Cement

O. ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete

P. ASTM C171 – Specification for Sheet Materials for Curing Concrete

Q. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete

R. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

S. ASTM C260 – Specification for Air-Entraining Admixtures for Concrete

T. ASTM C309 – Specification for Liquid Membrane-Forming Compounds for Curing Concrete

U. ASTM C494 – Specification for Chemical Admixtures for Concrete

V. ASTM C618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

W. ASTM C881 – Specification for Epoxy-Resin-Base Bonding Systems for Concrete

X. ASTM C1059 – Specification for Latex Agents for Bonding Fresh to Hardened Concrete

Y. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete

Z. ASTM C1107 – Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

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AA. ASTM C1240 – Specification for Silica Fume Used in Cementitious Mixtures

BB. ASTM C1315 – Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

CC. ASTM C1602 – Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

DD. ASTM D1751 – Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

EE. ASTM E1155 – Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers

FF. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

GG. ASTM E1745 – Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

HH. IBC – International Building Code

1.4 JOB CONDITIONS

A. In hot and cold weather, comply with the requirements of ACI 305 and 306.

B. Do not place concrete on frozen ground.

C. Unless adequate protection is provided, do not place concrete during rain, sleet, or snow.

D. Do not allow rainwater to increase mixing water or damage surface finish.

1.5 SUBMITTALS

A. General: All submittals shall be submitted in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

B. Mix Design: Submit mix design to be used for each class of concrete.

1. Submit location of materials source, admixtures to be used, and other related data

2. Submit test reports showing suitability of aggregates used in concrete mixes.

C. Detailed plan for curing and protection of concrete: Detailed plan for curing and protection of concrete placed and cured in cold weather. Plan shall include, but not be limited to, the following:

1. Procedures for protecting sub grade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.

2. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.

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3. Methods for temperature protection during placement.

4. Types of covering, insulation, housing, or heating to be provided.

5. Curing methods to be used during and following protection period.

6. Use of strength accelerating admixtures.

7. Methods for verification of in-place strength.

8. Procedures for measuring and recording concrete temperatures.

9. Procedures for preventing drying during dry, windy conditions.

D. Detailed plan for hot weather placements including curing and protection for concrete placed and cured in hot weather. Plan shall include, but not be limited to, the following:

1. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.

2. Use of retarding admixture.

3. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement.

4. Types of shading and wind protection to be provided.

5. Curing methods, including use of evaporation retardant.

6. Procedures for measuring and recording concrete temperatures.

7. Procedures for preventing drying during dry, windy conditions.

E. Informational Submittals:

1. Preinstallation Conference minutes.

2. Manufacturer's application instructions for bonding agent and bond breaker.

3. Manufacturer's Certificate of Compliance to specified standards:

a. Bonding agent.

b. Bond breaker.

4. Statement of Qualification:

a. Batch Plant: Certification as specified herein.

b. Mix designer.

c. Installer.

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d. Testing agency.

5. Field test reports.

6. Recorded temperature data from concrete placement where specified.

7. Tightness test results.

8. Concrete Delivery Tickets:

a. For each batch of concrete before unloading at Site.

b. In accordance with ASTM C94, including requirements 14.2.1. through 14.2.10.

c. Indicate amount of mixing water withheld and maximum amount that may be permitted to be added at Site.

1.6 QUALITY ASSURANCE

A. Concrete construction shall conform to requirements of ACI 117, ACI 301, & ACI 350, except as modified herein.

B. Qualifications:

1. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or approved equivalent program.

2. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in jurisdiction of the Work. Requirement may be waived if individual is Contractor's Licensed Design Engineer.

3. Testing Agency: Unless otherwise permitted, an independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

a. Where field testing is required of Contractor, personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-l or an equivalent certification program.

b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade 1. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.

C. Preinstallation Conference:

1. Required Meeting Attendees:

a. Contractor, including pumping, placing and finishing, and curing subcontractors.

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b. Ready-mix producer.

c. Admixture representative.

d. Testing and sampling personnel.

e. Engineer who authored Statement of Special Inspection Plan or Engineer's designee.

2. Schedule and conduct prior to incorporation of respective products into Project. Notify Engineer of location and time.

3. Agenda shall include:

a. Admixture types, dosage, performance, and redosing at Site.

b. Mix designs, test of mixes, and Submittals.

c. Placement methods, techniques, equipment, consolidation, and form pressures.

d. Slump and placement time to maintain slump.

e. Finish, curing, and water retention.

f. Thermal control plan.

g. Protection procedures for weather conditions.

h. Other specified requirements requiring coordination.

4. Conference minutes as specified in Section 01 31 19 - Project Meetings.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: Use Portland cement conforming to the requirements of ASTM C150 Type II for low alkali cement.

B. General Admixtures: Admixtures, other than air-entraining agents, may be used when the type and amount to be used are approved. Calcium chloride will not be allowed as an admixture.

C. Air-Entraining Agents: Use air-entraining agents to the requirements of ASTM C260 added to the mixing water.

D. Water Reducing Agents: Water reducing or water reducing and retarding admixtures may be used to increase workability of the concrete when approved by the Engineer. Use only admixtures produced by a company approved by the Engineer. Use water reducing admixtures conforming to ASTM C494.

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E. High Range Water Reducer: Conforming to ASTM C494, Type F or G. The preferred admixture shall be free of chlorides and alkalines. A second-generation-type high-range water reducer shall be Type G and be batch-plant-added.

F. Water: Use potable water for mixing concrete.

G. Coarse Aggregate: Use coarse aggregate that consists of gravel, crushed slag, crushed stone or other approved inert materials, composed of hard, strong and durable particles, free of injurious coatings, and conforming to the requirements of ASTM C33, except as modified herein.

1. Use only aggregates that include deleterious substances not exceeding the following:

	Percent Passing (by weight)
Soft Fragments	0.20
Coal and Lignite	0.30
Clay Lumps	0.30
Other Deleterious Substances	2.00
Minus 200 Material	1.75

2. Use coarse aggregate meeting the following gradations when tested in accordance to the requirements of ASTM C136.

	Percent Passing (by weight)				
Coarse Aggregate Size	1"	3/4”	3/8"	No. 4	No. 8
3/4” to No. 4	100	90-100	20-55	1-10	0-5

H. Fine Aggregate: Use aggregate of natural sand or other approved inert materials composed of hard, strong, and durable particles conforming to the requirements of ASTM C33 except as modified herein.

1. Use only aggregates that include deleterious substances not exceeding the following:

	Percent (by weight)
Clay Lumps	0.50
Coal and Lignite	0.30
Other Deleterious Substances	2.00
Minus 200 Material	1.75

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2. Moisture content of fine aggregate shall not exceed 8 percent.

3. Use fine aggregate that is uniformly graded from coarse to fine within the following gradation, when tested in accordance to the requirements of ASTM C136.

Sieve Size	Percent Passing (by weight)
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

I. Curing Compounds: Use curing compounds that meet the requirements of ASTM C309.

J. Chemical Hardener:

1. Colorless, aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent.

2. Not less than 2 pounds fluosilicate per gallon.

3. Provide materials which do not react with, inhibit, or otherwise interfere with adhesives and bonding of future floor finishes.

4. Acceptable Products: L&M Chem-Hard by Laticrete; MasterKure HD 300WB by BASF, or approved alternate.

K. Waterstops and Joint Fillers:

1. Waterstop of Joints: Extruded PVC waterstop, shape and size as shown on the drawings. Thermo bond all joints in PVC waterstops.

2. Expansive Water Stop: Expansive waterstop shall be a bentonite/butyl rubber based waterstop that expands on exposure to water. It shall be applied in accordance with manufacturer’s recommendations.

3. Joint Filler: Semi-rigid, closed-cell polypropylene or polyethylene foam expansion joint filler that meets ASTM test method D545 for compression recovery and water absorption. Joint filler cannot absorb water, swell or disintegrate.

L. Fly ash shall be Class F conforming to AASHTO M 295 with the additional requirement that the available alkalis in the fly ash shall not exceed 2 percent.

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M. Concrete Sealer: Concrete sealer is intended to be used on concrete slabs to prevent dusting and staining. The products listed are not intended to be used as curing compounds or for sealing the slab against water leakage.

1. Manufacturers: One of the following or equal:

a. Euco Diamond Hard by Euclid Chemical

b. L&M Seal Hard by Laticrete

2.2 PROPORTIONING

A. In proportioning materials for mixing, use certified scales. Do not use volume measurement except for water and liquid admixtures.

B. Concrete strength to be minimum 4,000 psi unless otherwise noted. Proportion the materials to produce concrete having the following properties or limitations:

Property of Mix	5,000 psi Concrete	4,000 psi Concrete	3,000 psi Concrete
Minimum Compressive Strength (at 28 day test) fc (pounds per square inch)	5,000	4,000	3,000
Minimum Compressive Strength (at 7 day test) (pounds per square inch)	2,800	2,600	1,800
Maximum Water Cement Ratio (by weight)	0.40	0.44	0.42
Min. Cement Content (94 pound sacks of cement per cubic yard of concrete)	6.5 sacks	6 sacks	5 sacks
Entrained Air Content (percent by volume)	6 ± 1	6.5 ± 1	5 ± 1
Slump Range (inches)	2-4	2-4	2-5

C. Fly ash may be used to replace a portion of the Portland cement in the concrete mix. The fly ash used shall not exceed 25 percent of the total cement material in the mix. The cement material in the mix includes both Portland cement and fly ash.

2.3 READY MIX CONCRETE

A. Ready-mixed concrete shall conform to the provisions in AASHTO M157 regarding batching, mixers and agitators, mixing and delivery, inspection, consistency and air content, and certification of batches.

2.4 GROUT

A. Where grout is shown for leveling, concrete (at least 3,000 pounds per square inch) shall be used.

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2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:

1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.

2. Laminated, reinforced 10 mil vapor barrier. Permeance of 0.025 per ASTM F1249.

3. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

4. Manufacturers, or Approved Equal:

a. Fortifiber Building Systems Group; Moistop Ultra 10: www.fortifiber.com/#sle.

b. ISI Building Products; Viper VaporCheck II 10-mil (Class-A): www.isibp.com/#sle.

c. Stego Industries, LLC; Stego Wrap, Class A: www.stegoindustries.com/#sle.

d. W.R. Meadows, Inc; PERMINATOR Class A – 10 mils: www.wrmeadows.com/#sle.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify lines, levels, and dimensions before proceeding with Work of this section.

B. Coordinate placement of embedded items with erection of concrete formwork and placement form accessories.

3.2 CONVEYING

A. Handle concrete from mixer to location of final placing as rapidly as practicable by methods which prevent segregation or loss of ingredients and assure that quality is maintained.

B. Use only equipment conforming to ASTM C94.

C. Use only approved pumping equipment that is rated for the lift and the capacity required for placement.

1. Control pneumatic placement to prevent segregation.

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2. Loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches.

3. Do not use aluminum or aluminum alloy pipes.

3.3 PLACING CONCRETE

A. Notify Engineer not less than 24 hours prior to commencement of placement operations.

B. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer. Where approved, record the amount of water added on site and provide with the special inspection reports.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Place concrete continuously or in layers of such thickness that no concrete is deposited on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within section.

1. If a section cannot be placed continuously, locate construction joints as indicated, or as approved by the Engineer.

2. If not indicated, locate construction joints not over 20 feet on center.

3. Place at such a rate that concrete which is being integrated with fresh concrete is still plastic.

4. Limit size of each placement to allow for strength gain and volume change as a result of shrinkage.

5. Make lifts not over 24 inches.

6. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials.

7. Remove temporary spreaders in forms where concrete placing has reached an elevation rendering their service unnecessary.

8. Temporary spreaders may remain embedded in the concrete only if made of metal or concrete, and if prior approval has been obtained.

9. Do not allow concrete to fall over 6 feet, except when starting a wall pour. Do not drop concrete over 24 inches when starting a wall pour.

10. Joints in Footings and Slabs:

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a. Ensure space beneath plastic waterstop is completely filled with concrete.

b. During concrete placement make visual inspection of entire waterstop area.

c. Limit concrete placement to elevation of waterstop in first pass, vibrate concrete under waterstop, lift waterstop to confirm full consolidation without voids, and place remaining concrete to full height of slab.

d. Apply procedure to full length of waterstop.

F. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing.

G. Control placement to prevent segregation.

H. Pumping of Concrete:

1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to ensure completion of concrete placement without cold joints in case of primary placing equipment breakdown.

2. Minimum Pump Hose (Conduit) Diameter: 4 inches.

3. Replace pumping equipment and hoses (conduits) that are not functioning properly.

I. Minimum Time between Adjacent Placements:

1. Construction or Control Joints: 7 days unless otherwise specified.

2. Construction joint between top of footing or slab, and column or wall: As soon as can safely be done without damaging previously cast concrete or interrupting curing thereof, but not less than 24 hours.

3. Expansion or Contraction Joints: 1 day.

4. For columns and walls with a height in excess of 10 feet, wait at least 2 hours before depositing concrete in beams, girders, or slabs supported thereon.

5. For columns and walls 10 feet in height or less, wait at least 1 hour prior to depositing concrete in beams, girders, brackets, column capitals, or slabs supported thereon.

J. Hot Weather:

1. Prepare ingredients, mix, place, cure, and protect in accordance with ACI 301, ACI 305.1, and as follows:

a. Maintain concrete temperature below 90 degrees Fahrenheit at time of placement, or furnish test data or other proof that admixtures and mix

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ingredients· do not produce flash set plastic shrinkage, or cracking as a result of heat of hydration. Cool ingredients before mixing to maintain fresh concrete temperatures as specified or less.

b. Provide for windbreaks, shading, fog spraying, sprinkling, ice, wet cover, or other means as necessary to maintain concrete at or below specified temperature.

K. Cold Weather Placement:

1. Unless otherwise permitted, shall be in accordance with requirements of ACI 306.1 and as follows:

a. Cold weather requirements shall apply when ambient temperature is below 40 degrees Fahrenheit or approaching 40 degrees Fahrenheit and falling.

b. Do not place concrete over frozen earth or against surfaces with frost or ice present. Frozen earth shall be thawed to acceptance of Engineer.

c. Unless otherwise permitted, do not place concrete in contact with surfaces less than 35 degrees Fahrenheit; requirement is applicable to all surfaces including reinforcement and other embedded items.

d. Provide supplemental external heat as needed when other means of thermal protection are unable to maintain minimum surface temperature of concrete as specified in ACI 306.1.

e. Maintain minimum surface temperature of concrete as specified in ACI 306.1 for no less than 3 days during cold weather conditions.

1) Protect concrete from freezing until end of curing period and until concrete has attained a compressive strength of 3,500 pounds per square inch or design compressive strength if less than 3,500 pounds per square inch.

2. Provide maximum and minimum temperature sensors placed on concrete surfaces spaced throughout Work to allow monitoring of concrete surface temperatures representative of Work. Unless otherwise permitted, record surface temperature of concrete at least once every 12 hours during specified curing period.

3.4 CONSOLIDATION

A. Consolidate by vibration so that concrete is thoroughly worked around reinforcement, embedded items, and into corners of forms to eliminate air or stone pockets.

B. Use internal vibrators with minimum frequency of 8,000 vibrations per minute. Do not use “jitterbugs” or similar devices.

C. Do not use vibrators to transport concrete.

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D. Insert vibrators approximately 18 inches apart. Leave in long enough to consolidate concrete without segregation; generally, from 5 to 15 seconds maximum. Insert vibrator through new lift into previous lift to ensure good bond between lifts.

E. Keep spare vibrator available during concrete operations.

F. Vibrate concrete in vicinity of joints to obtain impervious concrete.

G. Where concrete is to have an as-cast or smooth-rubbed finish, bring a full surface of mortar against form by vibration process, supplemented if necessary, by spading, to work coarse aggregate back from formed surface.

3.5 CONSTRUCTION JOINTS

A. Locate construction joints, if not indicated, so as to least impair strength of structure, subject to Engineer approval.

1. In general, locate near middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, offset joint in girder a distance equal to twice the width of the beam.

2. Locate joints in walls and columns at underside of floors, slabs, beams or girders, and at tops of footings or floor slabs.

3. Place beams, girders, brackets, column capitals, haunches, drop panels, and slabs concurrently.

4. Make joints perpendicular to main reinforcement.

B. Continue reinforcement across joints.

1. Provide keys and inclined dowels as directed by Engineer.

2. Provide longitudinal keys at least 1-1/2 inches deep in all joints in walls and between walls and slabs or footings.

C. Clean concrete surface at joints.

D. Remove all laitance prior to placing adjoining concrete.

E. When required, obtain bond by one of the following:

1. Use of an approved adhesive.

2. Use of an approved chemical retarder which delays setting of surface mortar. Remove retarded mortar within 24 hours after placing to produce a clean, exposed aggregate bonding surface.

3. Roughen surface of concrete in an approved manner which will expose aggregate uniformly.

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F. Dampen, but do not saturate, hardened concrete at construction joints, joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all others not mentioned below immediately prior to placing fresh concrete.

G. Dampen, but do not saturate hardened concrete at joints in exposed Work; joints in middle of beams, girders, hoists, and slabs; and joints in Work designed to contain liquids.

1. Thoroughly cover with a coat of cement grout of similar proportions to mortar in concrete.

2. Use grout as thick as possible on vertical surfaces and at least 1/2 inch thick on horizontal surfaces.

3. Place fresh concrete before grout has attained its initial set.

H. Prepare joints receiving an adhesive and apply adhesive in accordance with manufacturer's recommendations prior to placing of fresh concrete.

I. Prior to placing of fresh concrete, prepare surfaces of joints which have been treated with a chemical retarder in accordance with manufacturer's recommendations.

3.6 BLOCKOUTS FOR PIPE AND CONDUIT

A. Where pipe or conduit passes into or through concrete walls, floors, or roof slabs, the Contractor may, to facilitate proper alignment, leave holes through the concrete and pour the concrete opening after the pipe or conduit is in place. The size of such openings shall be 2 inches larger than the outside diameter of the bell, flange, or coupling, and shall conform to the special details for pipe openings shown on the plans. When the piping or conduit is entirely placed and securely anchored, the concrete openings through the walls will be poured in accordance with the requirements for bonding new concrete to old as set forth herein. Concrete used to pour these openings shall consist of 1 part cement, 1 part fine aggregate, 1 part non-shrinking aggregate, and 1-1/2 parts coarse aggregate of maximum size of 1/2 inch when the concrete is part of a basin which must hold liquids. Otherwise, the non-shrinking aggregate in these proportions shall be replaced by fine aggregate. Concrete poured in these openings shall be thoroughly vibrated or rodded to insure a watertight joint between the new and old concrete and the new concrete and the pipe or conduit. The form for the closure shall be constructed with a pouring funnel. A plug of concrete shall be left in the pouring funnel. After the concrete has taken its initial set, the plug shall be removed and the exposed, broken face ground smooth. Pouring of blockout holes shall be done from the pressure side whenever possible. Such joints shall be thoroughly cured by keeping them constantly wet for not less than 7 days.

B. Where approved by the Engineer, blockout holes may be dry packed using non-shrink grout for basins which must hold liquid, and normal grout in other places. Only sufficient water shall be added to make a dry, crumbling mass. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands, and when such a ball is broken, it should crumble. This mixture shall be tamped or rodded solidly into the space, preferably from the pressure side. A backing board or stop shall be provided at the back side of this space against which the mixture can be tamped. Curing shall be specified as above.

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3.7 GROUTING MACHINERY FOUNDATIONS

A. Where machinery is to be secured by anchor bolts set in concrete and supported on foundations which are to be grouted in place, the original concrete pour shall be blocked out or finished off a sufficient distance below the bottom of the machinery foundation to provide for the thickness of grout specified on the plans. After the machinery has been set in position and wedged to the proper elevation by steel wedges, the space between the bottom of the machinery foundation and the original pour of concrete shall be caulked with a dry-tamped in mixture of non-shrink grout. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands; and when such ball is broken, it should crumble. This dry mixture shall be tamped or rodded solidly into the space between the machinery foundations and the original concrete. A backing board or stop shall be provided at the back side of this space against which the dry mixture can be tamped.

3.8 PLACING SLABS

A. Preparation of sub-grade for Slabs on Grade:

1. Reference the Plans and Geotechnical Engineering Evaluation for all recommendations.

2. Keep subgrade free of frost.

3. If temperature where concrete is to be placed is below freezing, enclose, heat, and maintain temperature above 50 degrees Fahrenheit, long enough to remove all frost from subgrade.

4. Keep subgrade moist at time of concreting. If necessary, dampen with water in advance of concreting. Allow no free-standing water or muddy or soft spots when concrete is placed.

B. Locate Joints in Slabs as Indicated:

1. If saw-cut joints in slabs on grade are required or permitted, time cutting to eliminate raveling during sawing and before shrinkage cracks develop.

2. Cut as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw.

3. Compact before shrinkage stresses become sufficient to produce cracking.

C. Thoroughly Consolidate Concrete in Slabs:

1. Obtain consolidation of slabs with vibrating screeds, roller pipe screeds, internal vibrators, or other approved means.

3.9 PATCHING

A. Repair surface defects immediately after form removal. Coat all repaired areas with grey Sikagard 62.

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B. Fill and finish tie holds with non-shrink grout and coat with grey Sikagard 62.

C. Repair defective areas.

1. Use of plaster coat embeco or calcium chloride is prohibited.

2. Remove honeycomb and defective concrete down to sound concrete.

3. Make edges perpendicular to surface or slightly undercut.

4. Featheredges are not permitted.

5. Dampen area to be patched and at least 6 inches surrounding it to prevent absorption of patching mortar water.

6. Prepare bonding grout of approximately 1 part cement to 1 part fine sand passing a No. 30 sieve.

D. Make patching mixture of same materials and of approximately same proportions as used for concrete, except omit coarse aggregate.

1. Mortar: 1 part cement to 2 parts sand by damp loose volume.

2. Mix white and gray Portland cement as required to match surrounding concrete.

3. Keep mixing water to a minimum.

4. Mix patching mortar in advance and allow to stand with frequent manipulation, without addition of water, until it has reached stiffest placeable consistency.

E. After surface water has evaporated from patch area, brush bond coat into surface.

1. When bond coat begins to lose water sheen, apply patching mortar.

2. Thoroughly consolidate mortar into place and strike-off so as to leave patch slightly higher than surrounding surface.

3. Leave undisturbed for at least 1 hour before final finish.

4. Keep patched area damp for 7 days.

5. Do not use metal tools in finishing an exposed patch.

F. Repair of concrete shall provide structurally sound surface finish, uniform in appearance or upgrade finish by other means until acceptable by Engineer.

G. Tie Holes: After being cleaned and thoroughly dampened, fill tie holes solid with non-shrink grout and coat with Sikagard 62. Round tie holes less than 1/4 inch diameter by 1-1/2 inch deep in rough form finished surfaces need not be filled.

H. Remove metal objects not intended to be exposed in as-built condition of structure including wire, nails, and bolts, by chipping back concrete to a depth of 1 inch and then

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cutting or removing metal object. Repair chipped out concrete as specified for defective areas.

3.10 SLAB FINISHES

A. Float Finish: After concrete has been placed, consolidated, struck-off, and leveled, do not work further until ready for floating. Begin floating when water sheen has disappeared, and surface has stiffness sufficient to permit operation. Re-float slab immediately to a uniform sandy texture.

B. Troweled Finish: Float finish surface first. Power or hand trowel to produce smooth surface relatively free of defects, but which may still show some trowel marks. Final trowel when a ringing sound is produced as trowel is moved over surface. Leave finished surface essentially free of trowel marks, uniform in texture and appearance. Air entrained concrete shall not be trowel finished.

C. Broom Finish: Immediately after concrete has been floated, apply coarse transverse scored texture by drawing broom or burlap belt across surface.

D. "Dry Shake" Finish: Give surface a float finish. Apply mineral aggregate with Portland cement in proportions recommended by manufacturer of aggregate. Begin floating immediately after application of “dry shake."

E. Nonslip Finish: Give surface a "dry shake" application, as specified above, using crushed ceramically bonded aluminum oxide particles. Apply at 25 pounds per 100 square feet.

F. Exposed Aggregate Finish: Immediately after the surface of the concrete has been leveled to tolerance and surface water has disappeared, spread aggregate of the color and size selected by the Engineer uniformly over surface to provide complete coverage to the depth of a single stone. Float surface until embedded aggregate is fully coated with mortar and surface has been brought to tolerance. Flow water, without force, over surface of concrete while matrix encasing aggregate is removed by brushing with a fine bristle brush.

G. Slab Finish Schedule: The slab finishes are shown on the drawings. Where finishes of slabs are not shown, provide broom finish on exterior slabs and trowel finish on interior slabs.

H. Finish Slab Elevation: Slope slabs to floor drains and gutters. Slabs shall adequately drain regardless of tolerances.

3.11 FORMED CONCRETE FINISH

A. Rough Finish: Patch defects, chip or rub off fins exceeding 1/4-inch in height.

B. Smooth Finish: Patch tie holes and defects and remove fins completely. When surface texture is impaired and form joints misaligned by more than 1/8-inch, grind or bushhammer. Slurry grout areas evidencing minor mortar leakage to match adjacent concrete.

C. Rubbed Finish: Remove forms and perform necessary patching as soon after placement as possible. Finish newly hardened concrete no later than day following form removal. Wet

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surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced. No cement grout to be used other than cement paste drawn from concrete by rubbing process.

D. Sacked Finish: Mix one-part Portland cement and 1-1/2 parts fine sand with sufficient water to produce grout having consistency of thick paint or use commercial premixed sacking grout. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly. Immediately after grouting, scrub surface vigorously with cork float or stone to coat surface and fill voids. While grout is still plastic, remove excess grout by working surface with rubber float or sack. After surface whitens from drying, rub vigorously with clean burlap. Keep damp for at least 36 hours after final rubbing.

E. Formed Concrete Finish Schedule. The finish required for formed concrete is shown on the drawings. Where finishes of formed concrete are not shown, provide rough finish for concrete not exposed to view and rubbed finish for concrete exposed to view.

3.12 CURING AND PROTECTION

A. To preserve moisture in unformed concrete surfaces, apply one of the following immediately after placement and finishing.

1. Continuous mist spray.

2. Waterproof sheet materials, ASTM C171.

3. Curing compound, ASTM C309. Apply in accordance with recommendations of manufacturer immediately after water sheen has disappeared. Do not use on any surface against which additional concrete or other material is to be bonded or adhesively applied, unless it is proven that curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications. Provide curing compound compatible with hardener in areas where hardener is to be used.

B. Continue curing concrete for 7 days.

C. When mean daily outdoor temperature is less than 40 degrees Fahrenheit, maintain temperature of concrete between 50 degrees Fahrenheit and 70 degrees Fahrenheit for concrete placement.

D. Floors and slabs to receive concrete sealer as specified in the Contract Documents and Room Finish Schedule.

1. Apply concrete sealer at a coverage rate not to exceed 300 square feet per gallon.

2. Apply as soon as slab or floor will bear weight.

3. Before applying concrete sealer, sweep entire surface clean with very soft bristled brush that will not mark concrete finish and remove any standing water.

4. Apply concrete sealer with sprayer.

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5. Use of paint rollers or mop is not acceptable.

6. Workmen shall wear flat soled shoes which will not mark or scar concrete surface.

7. Do not allow traffic on floors and slabs until concrete sealer has dried and hardened.

3.13 BACKFILL AGAINST STRUCTURES

A. Do not backfill against walls until concrete has obtained specified 28-day compressive strength.

B. Refer to General Structural Notes on the Drawings for additional requirements, including elevated slab and diaphragm completion prior to backfill.

C. Unless otherwise permitted, place backfill simultaneously on both sides of structure, where such fill is required, to prevent differential pressures.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland Cement to two and one half parts fine aggregate passing No 16 sieve, using only enough water for handling and placing.

C. 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 in solid concrete, but not less than 1-inch in depth. Make edge of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Patch a test area at an inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.1-inches

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wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4-inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of the same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

8. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.15 FIELD QUALITY CONTROL

A. The Contractor shall obtain and pay for services of certified independent testing agency, as specified in the Section 01 45 00 – Quality Control. They shall perform sampling and testing of installed materials to assure that the requirements of this specification are met.

B. Provide adequate facilities for safe storages and proper curing of concrete test specimens onsite for first 24 hours, and for additional time as may be required before transporting to test lab.

C. Unless otherwise specified, sample concrete for testing for making test specimens, from point of delivery.

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D. When concrete is pumped, sample and test air content at point of delivery and at point of placement.

E. The frequency herein specified for each field control test is approximate. A greater or lesser number of tests may be made, as required by the Engineer, to verify compliance with these specifications.

F. Submit proposed mix design of each class of concrete to Engineer for review prior to commencement of Work.

G. Each 100 tons of fine aggregate and each 200 tons of coarse aggregate shall be sampled and tested in accordance with ASTM D75 and C136.

H. Entrained air: Test every load of concrete delivered to the project. Air content shall be determined in accordance with ASTM C231.

I. Slump: Test every load of concrete delivered to the project.

J. Pumped Concrete: Take concrete samples for slump, ASTM C143 and test specimens ASTM C31.

K. Strength characteristics: 1 set of 4 concrete test cylinders shall be made for every 40 cubic yards or less of each class of concrete placed each day. 1 additional set shall be taken from each additional 40 cubic yards, or major fraction thereof, placed in any 1 day. 1 cylinder of each set shall be tested at an age of 7 days and 2 cylinders shall be tested at an age of 28 days. The fourth cylinder of the sets shall be tested only if deemed necessary by the Engineer. Test results shall be evaluated in accordance with ACI 214 and 318.

L. 3 additional test cylinders will be taken during cold weather and shall be cured on site under the same conditions as the concrete it represents. 1 cylinder shall be tested at an age of 7 days and the other cylinder at an age of 28 days.

3.16 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances, or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by the Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION 03 30 00

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SECTION 03 60 00 – GROUTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish labor, materials and equipment as required for grouting as shown on the plans.

B. The following types of grout are covered in this Section:

1. Cement Grout
2. Non-Shrink Grout – Class I (cement based)
3. Non-Shrink Grout – Class II (cement based)
4. Epoxy Anchor Grout for Adhesive Anchors
5. Topping Grout and Concrete/Grout Fill

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

1. Certification of Materials:
   a. Use bags of materials showing that the contents meet the Specifications.
   b. Submit mill test certificates covering materials shipped as furnished by material manufacturers.
2. Certification that grouts used on the project contain no chlorides or other chemicals that cause corrosion.
3. Manufacturer’s literature containing instructions and recommendations on the mixing, handling, placement, curing and appropriate uses for each type of grout used in the Work, and locations of use. ICBO/ES report shall be submitted for epoxy anchor grout for adhesive anchors.
4. Manufacturer’s certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.
5. Contractor shall submit manufacturer’s written warranty.

1.3 QUALITY ASSURANCE

A. Construction Tolerances: Construction tolerances shall be as indicated in Section 03 30 00 – Cast-in-Place Concrete unless indicated otherwise.

B. Field Tests:

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1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to ensure continued compliance with these specifications. The specimens will be made by the Engineer or its representative.

2. Compression tests and fabrication of specimens for concrete grout and cement based non-shrink grout will be performed in accordance with ASTM C1107 – Packaged Dry, Hydraulic-Cement Grout (Non-shrink), at intervals during construction selected by the Engineer. A set of 3 specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.

3. Compression tests and fabrication of specimens for topping grout, and concrete/grout fill will be performed in accordance with Section 03 30 00 – Cast-in-Place Concrete, at intervals during construction as selected by the Engineer.

4. Compression tests and fabrication of specimens for epoxy grouts will be performed in accordance with ASTM C579 – Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfaces and Polymer Concretes, Method B, at intervals during construction as selected by the Engineer. A set of 3 specimens will be made for testing at 7 days, and each earlier time period as appropriate.

5. The cost of laboratory tests on grout will be paid by the Contractor.

6. The Contractor shall assist the Engineer in obtaining specimens for testing and shall furnish materials necessary for fabricating the test specimens

PART 2 - PRODUCTS

2.1 CEMENT GROUT

A. Cement grout shall be composed of 1 part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4,000 pounds per square inch.

B. Cement-based non-shrink grout shall be a prepackaged, inorganic, fluid, non-gas-liberating, non-metallic, cement type grout requiring only the addition of water. Cement from kilns burning metal-rich hazardous waste fuel shall not be used.

C. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout indicated herein shall be that recommended by the manufacturer for the particular application.

D. Grout shall not contain chlorides or additives that may contribute to corrosion and shall be formulated to be used at any consistency from fluid to plastic.

E. Cement-based non-shrink grout shall have the following minimum properties when tested at a fluid consistency at 28 days:

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1. Minimum tensile splitting strength of 500 pounds per square inch per ASTM C496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.

2. Minimum flexural strength of 1,000 pounds per square inch per ASTM C580 - Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

3. Minimum bond strength (concrete to grout) of 1,900 pounds per square inch per modified ASTM C882 - Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

4. Grout shall be certified for use in freeze/thaw environments.

2.2 NON-SHRINK GROUT

A. Class I Non-Shrink Grout: Class I non-shrink grout shall have a minimum 28-day compressive strength of 5,000 pounds per square inch when mixed at a fluid consistency. Class I non-shrink grout shall meet the requirements of ASTM C1107, Grade B or C, when mixed to fluid, flowable and plastic consistencies.

1. Grout shall have a maximum early age height change of 4.0 percent expansion and shall have no shrinkage (0.0 percent) in accordance with ASTM C827 - Early Volume Change of Cementitious Mixtures. The grout when tested shall not bleed or segregate at maximum allowed water.

2. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C1090 - Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

3. Furnish certification that the non-shrink property of grout is not based on gas production or gypsum expansion.

4. Class I Non-Shrink Grout shall be MasterFlow 713 by BASF; Five Star Grout by Five Star Products; Sikagrout 212 by Sika Corporation; L&M Duragrout by Laticrete; High-Flow Grout by Euclid Chemical Company; or equal.

B. Class II Non-Shrink Grout: Class II non-shrink grout shall be a high precision, fluid, extended working time, grout. The minimum 28-day compressive strength shall be 7500 pounds per square inch, when mixed at a fluid consistency. Grout shall have a maximum early age height change of 4.0 percent expansion and shall have no shrinkage (0.0 percent) in accordance with ASTM C827. Class II non-shrink grout shall meet the requirements of ASTM C1107 Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C939.

1. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C1090.

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2. Class II non-shrink grout shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C827 at temperature extremes of 45 to 90 degrees Fahrenheit in accordance with ASTM C1107.

3. The grout when tested shall not bleed or segregate at maximum allowed water content.

4. Provide certification that its non-shrink property is not based on gas production or gypsum expansion.

5. Class II non-shrink grout shall be Masterflow 928 by BASF; Five Star Fluid Grout 100 by Five Star Products; L&M Crystex by Latitcrete; or equal.

2.3 EPOXY ANCHOR GROUT

A. Epoxy anchor grout shall conform to ASTM C881 - Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class A, Band C, Grade 3 with the exception of gel time.

B. Heat deflection temperature per ASTM D648 - Deflection Temperature of Plastics Under Flexural Load shall be a minimum 120 degrees Fahrenheit.

C. Manufacturer shall certify that the epoxy anchor grout will maintain 90 percent of its strength up to a temperature of 125 degrees Fahrenheit.

D. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.

E. Epoxy anchor grout shall be capable of being used in submersed applications once cured.

F. Compressive strength per ASTM D695 - Compressive Properties of Rigid Plastics shall be 10,000 pounds per square inch minimum.

G. If the average working or operating temperature will be over 100 degrees Fahrenheit or in a high fire risk area, use cement based non-shrink grout and oversized holes.

H. Overhead anchors and anchors in fire-resistive construction shall be cast-in anchors.

I. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar. Embedment shall not exceed 67 percent of the member depth.

J. Epoxy anchor grout shall be SET-XP by Simpson; Pure110+ by DeWalt; RE 500 V3 by Hilti, or equal.

2.4 TOPPING GROUT AND CONCRETE/GROUT FILL

A. Where fill is thicker than 3 inches, structural concrete, as indicated in Section 03 30 00 - Cast-in-Place Concrete, may be used when accepted by the Engineer.

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B. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated herein. Materials and procedures indicated for normal concrete in Section 03 30 00 - Cast-in-Place Concrete shall apply unless indicated otherwise.

C. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45.

D. Coarse aggregate shall be graded as follows:

U.S. Standard Sieve Size	Percent by Weight Passing
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

E. Final mix design shall be as determined by trial mix design as indicated in 03 30 00 – Cast-in-Place Concrete, except that drying shrinkage tests are not required.

F. Strength: Minimum compressive strength of topping grout and concrete/grout fill at 28 days shall be 4,000 pounds per square inch.

2.5 CURING MATERIALS

A. Curing materials shall be in accordance with Section 03 30 00 – Cast-in-Place Concrete and as recommended by the manufacturer of prepackaged grouts.

2.6 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where dry pack is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.

B. The slump for topping grout and concrete/grout fill shall be adjusted to match placement and finishing conditions but shall not exceed 4 inches.

2.7 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

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PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Grout shall be stored in accordance with manufacturer's recommendations.

3.2 GENERAL

A. Contractor shall arrange for the manufacturer of prepackaged grouts to provide on-Site technical assistance within 72 hours of request, as part of the Work.

B. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the Engineer.

C. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water for 24 hours prior to placement. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. Concrete substrate shall not be wet prior to placement of epoxy grouts.

D. Surface preparation, curing, and protection of cement grout shall be in accordance with Section 03 30 00 – Cast-in-Place Concrete. The finish of the grout surface shall match that of the adjacent concrete unless otherwise indicated.

E. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

F. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable. Shade the Work from sunlight for at least 24 hours before and 48 hours after grouting.

3.3 APPLICATION

A. Unless indicated otherwise, grouts shall be provided as listed below:

Application	Type of Grout
Anchor bolts and reinforcing steel required to be set in grout in which the average working or operating temperature will be over 100 degrees Fahrenheit, or in high fire risk areas.	Non-Shrink – Class I
Anchor bolts and reinforcing steel required to be set in grout that is not high temperature or high fire risk areas.	Epoxy Anchor Grout
Beam and column (1 or 2 story) base plates less than 16 inches in the least dimension.	Non-Shrink Class I
Column base plates (greater than 2 story or larger than 16 inches in the least dimension).	Non-Shrink Class II
Storage tanks and other non-motorized equipment and machinery under 30 horsepower.	Non-Shrink Class I

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Machinery over 30 horsepower and equipment under 30 horsepower but subject to severe shock load and high vibration.	Non-Shrink Epoxy
Filing blockout spaces for embedded items such as railing posts, gate guide frames, etc.	Non-Shrink Class I (Class II where placement time exceeds 20 min.)
Under precast concrete elements.	Non-Shrink Class II
Topping and concrete/grout fill greater than 3 inches thick.	Structural Concrete per Section 03 30 00 – Cast-in-Place Concrete
Surface repairs.	Cement Grout
Repair of holes and defects in concrete members which are not water bearing and not in contact with soil or other fill material.	Non-Shrink Class I
Repair of holes and defects in concrete members which are water bearing or in contact with soil or other fill materials.	Non-Shrink Class II
All application not listed above, where grout is called for on the drawings.	Non-Shrink Class I, unless noted otherwise.

3.4 GROUTING PROCEDURES

A. Mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Structural, equipment, tank, and piping support bases shall be grouted, unless indicated otherwise.

1. The original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a minimum one-inch thickness of grout, or a thickness as indicated.

2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout through a headbox of appropriate size. The mixture shall be of a fluid consistency and poured continuously into the space between the plate and the base concrete. Forms for grout shall be tight against retaining surfaces, and joints shall be sealed as recommended by the grout manufacturer to be liquid-tight. Forms shall be coated as recommended by the grout manufacturer for easy form release. Where this method of placement is not practical or where required by the Engineer, alternate grouting methods shall be submitted for acceptance by the Engineer.

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C. Drilled anchors and Reinforcing Bars: Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill and cleaned. Drilled anchors shall not be installed until the concrete has reached the required 28-day compressive strength. Anchors shall not be loaded until the grout has reached its indicated strength in accordance with the manufacturer's instructions.

1. The Contractor shall identify position of reinforcing steel and other embedded items prior to drilling holes. Care shall be exercised in coring and drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and communications conduit, and piping.

D. Epoxy Adhesive Anchors: Grout shall be proportioned and mixed with automatic equipment. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's recommendations but shall not be less than 8 diameters for threaded rod, or 12 diameters recommendations for reinforcing or smooth bars. Holes shall be dry.

E. Cement Based Non-Shrink Grout: In places of high temperature or fire hazard, anchor bolts shall be grouted in using cement based non-shrink grout, Class I. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICBO report, but shall not be less than 16 diameters for threaded rod or 24 diameters for reinforcing or smooth bars.

1. When the bolt diameter is 1 inch or less, the hole diameter should be a minimum of 2-inches. When the bolt diameter is greater than 1 inch, the hole diameter should be at least twice the bolt diameter.

2. Drilled holes shall be saturated with water for not less than 24 hours before installation of anchor/rod/rebar.

3. The non-shrink grout should be placed in the holes in a non-sag (trowelable) consistency. The grout should be placed in the holes before the anchor and then the anchor inserted and vibrated to ensure proper coverage.

F. Topping Grout and Concrete/Grout Fill: Mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively, where accepted by the Engineer, the base slab shall be given a roughened textured surface by a close- spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.

1. The minimum thickness of grout topping and concrete/grout fill shall be 1 inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-1/2 inches deep.

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2. The base slab shall be thoroughly cleaned and wetted to Saturated Surface Dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.

3. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

4. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.

5. As soon as topping or fill finishing is completed, coat surface with curing compound. After the topping is set and sufficiently hard in clarifiers and where required by the Engineer, the tank shall be filled with sufficient water to cover the entire floor for 14 days.

3.5 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be grouted is completely filled.

3.6 CURING

A. Cement based grouts shall be cured per Section 03 30 00 – Cast-in-Place Concrete and per the manufacturer's recommendations.

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3.7 GROUTING MACHINERY FOUNDATIONS

A. Where machinery is to be secured by anchor bolts set in concrete and supported on foundations which are to be grouted in place, the original concrete pour shall be blocked out or finished off a sufficient distance below the bottom of the machinery foundation to provide for the thickness of grout specified on the Plans. After the machinery has been set in position and wedged to the proper elevation by steel wedges, the space between the bottom of the machinery foundation and the original pour of concrete shall be caulked with a dry, tamped-in mixture of non-shrink grout. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands; and when such ball is broken, it should crumble. This dry mixture shall be tamped or rodded solidly into the space between the machinery foundations and the original concrete. A backing board or stop shall be provided at the back side of this space against which the dry mixture can be tamped.

END OF SECTION 03 60 00

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SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install miscellaneous metal items as shown on the drawings and specified herein.

B. Provide shop any fabricated and manufactured steel and aluminum as shown on the drawings and specified herein.

1.2 STANDARDS

A. AISC “Code of Standard Practice.”

B. ANSI A14.3 – American National Standard for Ladders – Fixed – Safety Requirements

C. ASTM A36 – Specification for Carbon Structural Steel

D. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

E. ASTM A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

F. ASTM A283 – Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

G. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

H. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

I. ASTM A786 – Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates

J. ASTM B209 – Specification for Aluminum and Aluminum-Alloy Sheet and Plate

K. ASTM B221 – Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles, and Tubes

L. ASTM B429 – Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

M. ASTM B663 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel

N. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

O. ASTM D1187 – Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal

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P. ASTM F1941 – Specification for Electrodeposited Coatings on Threaded Fasteners.

Q. ASTM F3125 – Specification for High Strength Structural Bolts, Steel, and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength

R. AWS D1.1 – Structural Welding Code – Steel

S. AWS D1.2 – Structural Welding Code – Aluminum

T. SSPC-SP 11 – Power Tool Cleaning to Bare Metal

U. SSPC-SP 2 – Hand Tool Cleaning

V. SSPC-SP 6 – Commercial Blast Cleaning

1.3 SUBMITTALS

A. General: All submittals shall be submitted in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Prepare shop drawings from field measurements where possible.

2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

D. Welder's Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.4 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Quality procedures and personnel according to the following:

1. AWS D1.1 – Structural Welding Code – Steel.

2. AWS D1.2 – Structural Welding Code – Aluminum

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1.6 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 45 00 – Quality Requirements, will inspect installed shop fabricated and manufactured steel and aluminum items for conformance to contract documents.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store and protect products with special custom wrapping and handling procedures to protect and touch-up shop primers at every stage of shipping.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's written recommendations to ensure that shop primers and topcoats are compatible with one another.

PART 2 - PRODUCTS

2.1 MATERIALS - STEEL

A. HSS (Hollow Structural Shapes): ASTM A500 Grade B

B. Bars, plates, miscellaneous shapes: ASTM A36

C. Aluminum: Alloy 5052-H32, mill finish

D. Plates: ASTM A283

E. Checkered Plate (Diamond Plate): ASTM A786, galvanized rolled steel floor plate; diamond pattern. Provide 1/4-inch thickness unless otherwise indicated.

F. Fasteners: Provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Shop and Touch-Up Primer for Galvanized Surfaces: Either Tnemec Series 27 Typoxy WB at 2 to 2.5 mils or primer specified in Section 09 90 00 – Paintings and Coatings, complying with VOC limitations of authorities having jurisdiction.

2.2 MATERIALS – ALUMINUM

A. Extruded Aluminum: ASTM B221, 6063 alloy, T6 temper, 6061 alloy, T6 temper, or 6005 alloy, T5 temper, as standard with manufacturer.

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B. Sheet Aluminum: ASTM B209, 5052 alloy, H32 or H22 temper, or 5005 alloy, H34 temper, as standard with manufacturer.

C. Extruded Structural Pipe and Round Tubing: ASTM B429, Alloy 6063-T6, standard weight, Schedule 40 pipe, unless otherwise required to meet performance requirements.

D. Bolts, Nuts, and Washers: Stainless steel.

E. Welding Materials: AWS D1.2; type required for materials being welded.

F. Miscellaneous Bolts and Nuts: ASTM A307

G. High Strength Bolts and Nuts: ASTM F3125 Grade A325

H. Concrete Anchors: Use cast in anchor bolts where cast in anchor bolts are shown on the drawings. Provide attachment to concrete with concrete anchors where shown on the drawings conforming to the following types. Use only type of concrete anchor shown on the drawings.

1. Expansion Anchors: Expansion anchors shall be wedge type with a single piece three section wedge to anchor the stud in the hole. The stud nut and wedge shall be ANSI 304 stainless steel.

2. Adhesive Anchors: Adhesive anchors shall be an all thread rod with a nut. The all thread rod and nut shall be ANSI 304 stainless steel. The rod shall be anchored in the hole using a premeasured adhesive capsule consisting of vinyl urethane methacrylate adhesive.

3. Undercut Anchors: Undercut anchors shall be an undercut style with a brazed tungsten carbide edge on the undercutting end to perform the self-cutting undercut as the anchor is installed. The anchor shall cut and undercut bearing area of at least 2.5 times the nominal anchor bolt size. The anchor stud shall be ANSI 316 stainless steel.

I. Stainless Steel Bolts and Nuts: Type 316 Stainless Steel

2.3 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application): Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be steel as indicated herein. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated, steel for bolt material, anchor bolts and cap screws shall be in accordance with the following:

Structural Connections	ASTM A307, Grade A or B, hot-dip galvanized
Anchor Bolts	ASTM A307, Grade A or B, or ASTM A36, hot-dip galvanized

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High Strength Bolts	ASTM F3125 Grade 325
Pipe and Equipment Flange Bolts	ASTM A193, Grade B- 7

B. Stainless steel bolts and nuts for corrosive service

1. Corrosive Service: All bolts, nuts, and washers in the locations listed below shall be stainless steel as indicated below.

a. All buried locations.

b. All submerged locations.

c. All locations subject to seasonal or occasional flooding.

d. Inside hydraulic structures below the top of the structure.

e. Inside buried vaults, manholes, and structures which do not drain through a gravity sewer or to a sump with a pump.

f. Inside trenches, containment walls, and curbed areas.

g. Locations indicated by the Contract Documents or designated by the ENGINEER to be provided with stainless steel bolts.

2. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be Type 316 stainless steel, Class 1, conforming to ASTM A193 for bolts and to ASTM A194 for nuts. All threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.

a. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.

b. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

C. Bolt Requirements: The bolt and nut material shall be free-cutting steel. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.

D. Bolts and nuts shall be installed with washers fabricated of material matching the base material of bolts, except that hardened washers for high strength bolts shall conform to the requirements of the AISC Specification. Lock washers fabricated of material matching the bolts shall be installed where indicated.

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E. The length of each bolt shall be such that after the joint is made up, the bolt extends through the entire nut, but in no case more than 1/2-inch beyond the nut.

F. Adhesive Anchors: Unless otherwise indicated, all drilled, concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.

1. Adhesive anchors are required for drilled anchors for indoor installations, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring reinforcing bars. Threaded rod shall be stainless steel Type 316. Epoxy adhesive shall be Hilti HIT RE 500 V3.

2. Unless otherwise indicated, glass capsule, polyester resin adhesive anchors will be permitted in locations not included above and shall be Hilti HVA or Cobra Anchors. Threaded rod shall be galvanized steel.

G. Expanding-Type Anchors: Expanding-type anchors if indicated or permitted, shall be galvanized steel expansion type ITW Ramset/Redhead "Trubolt" anchors; Hilti "Kwik-Bolt;" or equal. Lead caulking anchors will not be permitted. Size shall be as indicated. Embedment depth shall be as the manufacturer recommends for the load to be supported. Expansion type anchors which are to be embedded in grout may be steel. Non-embedded buried or submerged anchors shall be stainless steel.

H. Overhead Applications: Use Hilti HDA undercut anchors.

I. Miscellaneous Bolts and Nuts: ASTM A307

J. High Strength Bolts and Nuts: ASTM F3125 Grade A325

K. Concrete Anchors: Use cast in anchor bolts where cast in anchor bolts are shown on the drawings. Provide attachment to concrete with concrete anchors where shown on the drawings conforming to the following types. Use only type of concrete anchor shown on the drawings.

1. Expansion Anchors: Expansion anchors shall be wedge type with a single piece three section wedge to anchor the stud in the hole. The stud nut and wedge shall be ANSI 304 stainless steel.

2. Adhesive Anchors: Adhesive anchors shall be an all thread rod with a nut. The all thread rod and nut shall be ANSI 304 stainless steel. The rod shall be anchored in the hole using a premeasured adhesive capsule consisting of vinyl urethane methacrylate adhesive.

3. Undercut Anchors: Undercut anchors shall be an undercut style with a brazed tungsten carbide edge on the undercutting end to perform the self-cutting undercut as the anchor is installed. The anchor shall cut and undercut bearing area of at least 2.5 times the nominal anchor bolt size. The anchor stud shall be ANSI 316 stainless steel.

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2.4 IMPACT ANCHOR

A. Impact anchors shall be an expansion type anchor in which a nail type pin is driven to produce the expansive force. The pin shall have a zinc sleeve with a mushroom style head and stainless steel nail pin. Anchors shall be Metal HIT Anchors, manufactured by Hilti, Inc., Rawl Zamac Nailin, manufactured by the Rawlplug Company; or equal.

2.5 MISCELLANEOUS MATERIALS

A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

B. Nonshrink, Metallic Grout: Factory packaged, ferrous-aggregate grout complying with ASTM C1107, specifically recommended by manufacturer for heavy-duty loading applications. Refer to Section 03 60 00 – Grouting for further requirements.

2.6 FABRICATION

A. Workmanship: Conform to accepted shop practices. Form work true to details, with clean, straight, sharply defined profiles.

B. Fit and shop assemble items in largest practical sections, for delivery to site. 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.

C. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for intended use and, where applicable, to meet performance requirements.

D. Fabricate items with joints tightly fitted and secured.

E. Continuously seal joined members by continuous welds, unless otherwise indicated on Drawings.

F. Joints and Connections: Weld all joints, unless other fastening methods are shown, specified or specifically approved. Close fit exposed joints; making joints where least conspicuous. Unless otherwise shown or specified, use flat and countersunk beaded bolts or screws in exposed connections.

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

I. Cutting, Drilling; Perform cutting, drilling, punching required for accurate fitting and assembly work. In addition, perform similar operations as required for attachment of work of other trades, provided that directions for such work are supplied prior to shop drawing approvals.

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J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

1. Provide anchor bolts for connecting to other work.

a. Drill and tap steel as required to receive bolted connections.

b. Make bolt holts 1/16-inch large than nominal bolt diameter.

K. Provisions for Attachment to Structure: Furnish miscellaneous metal items complete with framing, supports, hangers, bracing, anchors, and other devices shown specified or necessary for reinforcement and proper, secure setting or attachment to building construction.

L. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

M. Dissimilar Materials Protection: Insulate aluminum surfaces in contact with metals other than galvanized or stainless steel, or with plaster or concrete, by means of chromate gasketing or heavy coat of alkali-resistant bituminous paint.

N. Workmanship: Fabricate all items neatly and rigidly in accordance with details in first-class finished, workmanlike manner. Form curved work neatly to radii indicated. Provide members of sizes indicated and weld, bolt or rivet securely together. Furnish bolts, nuts, washers, and other fastening devices required for anchoring and securing work.

O. Welding: Use electric shielded-arc process in accordance with Welding Specifications of American Welding Society. Use only welding operators properly trained and highly skilled in arch welding. Grind smooth surface welds exposed to view.

2.7 SHOP FINISHING

A. Steel Metal Items: Galvanize all iron or steel items. Prior to galvanizing, all items after fabrication shall be cleaned thoroughly, removing scale, flux deposits, rust, oil, dirt, and other foreign matter. Except as otherwise indicated, iron or steel items specified to be galvanized shall be hot-dip galvanized after fabrication in accordance with ASTM A123. Fabricate units complete or in largest practical sections before galvanizing.

B. Aluminum Metal Items: Aluminum guardrail and handrails shall be finished with a 0.7 mil clear anodized finished, unless noted otherwise. All structural aluminum elements such as beams, columns, ledgers, structural connectors, all stair framing elements, including treads, and hand and guard rails, shall be anodized.

2.8 FINISHES – STEEL

A. Galvanizing and prime paint all exterior steel items.

B. Prime paint all steel items.

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1. Exceptions: Galvanized items to be embedded in concrete and items to be embedded in masonry.

C. Prepare surfaces to be primed in accordance with SSPC-SP 2 where indicated to receive manufacturer's standard primer.

D. Prepare surfaces to be primed in accordance with SSPC-SP 6 where indicated to receive high-performance coating finish.

E. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

F. Prime Painting: One coat of specified primer applied in strict accordance with primer manufacturer's instructions.

1. Provide one coat of manufacturer's standard primer for the following items:

a. Interior ladders.

G. Galvanizing: Galvanize after fabrication to ASTM A123 requirements.

2.9 FINISHES – ALUMINUM

A. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).

2.10 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16-inch.

C. Maximum Misalignment of Adjacent Members: 1/16-inch.

D. Maximum Bow: 1/8-inch in 48 inches.

E. Maximum Deviation from Plane: 1/16-inch in 48 inches.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Clean and strip primed steel items to bare metal where site welding is required.

C. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

D. Embedded Items: Deliver miscellaneous metal items to be embedded or installed in concrete with setting instruction to concrete contractor for setting. Verify grade and line positioning of items as set, report errors or deviations in order that corrective adjustments may be made before placement of concrete or laying of masonry.

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E. Coat all aluminum surfaces in contact with concrete with an approved bituminous coating or zinc chromate primer.

3.2 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. 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, thru bolts, lag screws, wood screws, and other connectors.

C. Concrete Anchors: Install concrete anchors in cast in place concrete and masonry according to the details shown on the drawings and as recommended by the anchor manufacturer. When installing concrete anchors in masonry always install anchors in masonry cells that have been grouted solid. Do not install anchors into hollow cell masonry.

D. Install items plumb and level, accurately fitted, free from distortion or defects.

E. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

F. Field weld components as indicated.

G. Perform field welding in accordance with AWS D1.1

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.

H. Obtain approval prior to site cutting or making adjustments not scheduled.

I. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

J. Expansion, Contraction: Assemble and install work with adequate provisions to prevent objectionable distortion and overstressing from expansion, contraction. Where necessary, provide properly designed expansion joints, construct to be weather tight if to be exposed to the weather.

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K. Field Touch-up: After installation of miscellaneous metal items, tough-up field bolts, field welds, uncoated connections and abrasions with ship protective coatings. Clean items of mud, dirt, and other objectionable foreign matter.

L. Finishing: Where indicated, metal fabrication items shall be painted after installation in accordance with Section 09 90 00 – Painting and Coating.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. Install framing and supports to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on Shop Drawings.

3.4 INSTALLING 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 grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

1. Clean surfaces of weld seams according to SSPC-SP 11, "Power Tool Cleaning to Bare Metal".

3.6 TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch

END OF SECTION 05 50 00

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SECTION 08 31 00 – ACCESS DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and install access doors in locations as shown on the drawings and as specified herein. Access doors for valve vaults shall be standard doors as specified herein. Access doors for pump hatch at wet wells shall include safety grate to provide fall protection.

1.2 STANDARDS

A. "Architectural Sheet Metal Manual" by Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACCNA).

B. ASTM A36: Standard Specification for Structural Steel

1.3 SUBMITTALS

A. General: All submittals shall be submitted in accordance with the requirement of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: For each type of door, showing all data required for installation and anchoring. Drawings to include profiles, accessories, location, adjacent construction interface, dimensions, and installation and anchoring instructions

C. Manufacturer's Data: Submit manufacturer's product data and installation requirements.

D. Provide manufacturer's warranty. Material shall be free of defects and workmanship for a period of 5 years form the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B209 plate alloy 3003-H 14 or 5005-H 14, 1/4-inch minimum thickness and 6063 T5 extruded frame.

B. Steel ASTM A36 grade, 1/4-inch minimum thickness.

C. Stainless Steel: Type 316.

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D. Neoprene: Closed cell foam, ASTM C509, 10 pounds per cubic foot density.

E. Odor Control and Debris Gaskets: EPDM rubber, ASTM D2000 M2MAA607

2.2 FABRICATION

A. Standard Doors: Fabricate a frame of extruded aluminum and doors of diamond plate aluminum. All doors shall be reinforced to support AASHTO HS-20 loading and a maximum deflection of 1/150 the span or. Each access door size is indicated on the drawings. Provide with neoprene seal. Equip door with lock key. Provide lower side with handle, hold open arm, and torsion spring or other opening assisting device. Provide Bilco Model J or JD, Babcock-Davis, Milcor, or equal. Provide frame anchors, 8 min.

1. Frame: Channel frame shall be 1/4-inch aluminum with full anchor flange around the perimeter.

2. Cover: Shall be 1/4-inch aluminum diamond pattern.

3. Hinges: Shall be designed for horizontal installation and shall be thru-bolted to the cover with tamper-proof type 316 stainless steel lock bolts and shall be thru-bolted to the frame with type 316 stainless steel bolts and locknuts.

4. Drain Coupling: Provide a 1-1/2-inch drain coupling located in the right front corner of the channel frame. Drain coupling can be placed at a different location if specified.

5. Lifting Mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4-inch gusset support plate.

6. Exterior Handle: A removable exterior turn/lift handle with a spring-loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.

7. Hardware:

a. Hinges: Heavy forged brass hinges, each having a minimum 3/8-inch diameter type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.

b. Cover: Shall be equipped with a hold open arm which automatically locks the cover in the open position. Cover shall be fitted with the required number and size of compression spring operators. A type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.

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c. Hardware: Compression spring tubes shall be anti-corrosive composite. All fasteners and other hardware shall be type 316 stainless steel material.

B. Vault Doors: Fabricate a frame of extruded aluminum and doors of diamond plate aluminum.

1. Doors shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span. Loading requirements and size are indicated on the drawings for each access door.

2. Provide frame anchors (8) min.

3. Provide with continuous 1/8" neoprene seal.

4. Latch: Type 316 stainless steel slam lock with fixed interior handle and removable exterior turn/lift handle.

5. Lift assistance: Provide compression spring operators enclosed in telescopic tubes or equivalent. An automatic hold open arm shall lock the cover in the open, 90-degree position.

6. Hinges, Lift Assist Devices, Locks and Handles, and Hardware: Stainless Steel, Type 316.

7. Provide Bilco Model J-AL or JD-AL, Babcock-Davis, or equal. Provide frame anchors (8) min.

8. Channel frame shall have a continuous anchor flange and a 1-1/2-inch drainage coupling. Frame shall be coated with a bituminous coating where it will be in contact with concrete. **Contractor note that frame drainage shall be piped to vault floor drains:**

a. Channel Drains

1) Channel drains in normally dry vaults and manholes shall be piped to the floor drain.

2) Drain pipe shall be Schedule 40, Type 316 stainless steel and shall be a minimum of 1 1/2" diameter. Support piping in accordance with specifications using only Type 316 stainless steel supports, hardware, and anchors.

3) Wall pipe penetrations shall be as per the mechanical standard details and shall be water tight.

C. Fall Protection Grating System for Access Doors:

1. Grate openings shall allow for visual inspection while the safety grate fall through protection is left in place. Design shall ensure that the fall through protection is in place before the doors can be closed, thereby protecting the next operator. Each grate shall be provided with a permanent hinging system, which shall lock the grate

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in the 90-degree position once opened. Each grate shall have a pull open arm, designed so the grate can be pulled open, with the grate acting as a barrier between the operator and the pit. A padlock hasp is provided for owner-supplied padlock.

2. Fall protection grating shall be rated for a minimum live load of 300 psf and shall be designed to meet OSHA 29 CFR 1910.23 requirements.

3. Grating shall be aluminum and powder-coated with a high visibility paint.

4. Hold open devices and all hardware shall be Type 316 stainless steel.

5. Fall protection to be provided as indicated on the plans.

2.3 FINISH

A. Mill finish aluminum with lacquer on exposed sides and bituminous coatings on concealed surfaces that come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Deliver products in manufacturer's original packaging. Store materials in a dry, well-vented area.

B. Verify rough openings are correctly sized and located.

C. Coordinate with trades installing adjacent materials. Anchor firmly to lid by casting into concrete or equivalent fasteners as approved.

D. Install in accordance with Manufacturer's instructions and approved shop drawings.

E. Test units for proper function and adjust until proper operation is achieved.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 00

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SECTION 09 90 00 – PAINTING AND COATING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials and equipment as required for all painting and coatings as specified herein. All materials, equipment, piping and miscellaneous surfaces shall be coated except for those indicated under Part 1.7. Work includes but is not to be limited to cleaning and preparation of surfaces, paint materials, and the application of all paint and other materials. Provide third party inspection of surface preparation, application and testing of coating and painting during application.

B. Provide coatings for pipe identification as specified in Section 40 05 97 – Piping Identification.

C. Any painting or coating in contact with potable drinking water, or water that will become potable drinking water, shall be NSF/ANSI 61 Certified.

1.2 DEFINITIONS

A. The term paint, coatings, or finishes, as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

B. Dry Film Thickness (DFT): The minimum dry film thickness, without any negative tolerance.

C. Submerged Metal: Steel or iron surfaces below tops of channel or structure walls which will contain water even when above expected water level.

D. Submerged Concrete and Masonry Surfaces: Surfaces which are or will be:

1. Underwater.

2. Inside structures which normally contain water.

3. Below tops of walls of water containing structures.

E. Exposed Surface: Any metal or concrete surface, indoors or outdoors, that is exposed to view.

F. Volatile Organic Compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon, as determined by EPA Method 24.

G. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.

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H. Where SSPC surface preparation standards are specified or implied for ductile iron pipe or fittings, the equivalent NAPF surface preparation standard shall be substituted for the SSPC standard.

1.3 REFERENCE STANDARDS

A. Codes and Standards: In addition to the requirements of these Specifications, the work to be performed under this Section is to comply with the following codes and regulations:

1. The Society of Protective Coatings Specifications (SSPC):

a.	SSPC SP-1	Solvent Cleaning.
b.	SSPC SP-2	Hand Tool Cleaning.
c.	SSPC SP-3	Power Tool Cleaning.
d.	SSPC SP-5	White Metal Blast Cleaning.
e.	SSPC SP-6	Commercial Blast Cleaning.
f.	SSPC SP-7	Brush-Off Blast Cleaning.
g.	SSPC SP-10	Near-White Blast Cleaning.
h.	SSPC SP-11	Power Tool Cleaning to Bare Metal.
i.	SSPC-SP-12	High- and Ultrahigh-pressure Water Jetting.
j.	SSPC-SP-13	Surface Preparation of Concrete
k.	SSPC-SP-16	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

2. Underwriters' Laboratory (UL):

a.	UL 3P83	Drinking Water System Components - Health Effects.

3. National Association of Corrosion Engineers Standards (NACE):

a.	SP0188-06	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

4. Applicable Standards of American National Standards Institute, Inc. (ANSI)

5. National Association of Pipe Fabricators (NAPF):

a.	NAPF 500-03	Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.

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6. American Society for Testing and Materials (ASTM):

a.	ASTM D4262	Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
b.	ASTM D4263	Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
c.	ASTM D4285	Test Method for Indicating Oil or Water in Compressed Air.
d.	ASTM D4541	Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.

1.4 QUALITY ASSURANCE

A. Pre-Application Conference: Prior to commencement of any paint application, the Engineer will hold an on-site pre-application meeting. The purpose of meeting is to establish a working understanding between all parties and to discuss items that pertain directly to the paint application.

B. Painter's Qualifications: The work specified under this Section shall be performed by or under the supervision of a qualified painter. The Contractor shall be required to document the painter's experience, competence and ability to comply with the requirements of these Specifications and to complete the work in a timely manner. The Painter or Applicator shall have the following qualifications:

1. Minimum of 5 years of experience applying specified type or types of coatings under conditions similar to those of the Work. Provide qualifications of applicator and references listing five similar projects completed in the past two years.

2. Manufacturer approved applicator when manufacturer has approved applicator program.

C. Coatings Inspection: Surface preparation, mixing, thinning, coating application, and measurement of dry film thicknesses shall be performed by a NACE Certified Coatings Inspector. Each requirement of this specification shall be met and approved by the Inspector prior to moving on to the next step in the progression of the coating’s specification.

D. Standard Products: All paints in a paint system are to be the standard products. All products applied in any paint and coating system shall be from a single manufacturer.

E. The NACE Inspector must approve all surface preparation prior to the application of coatings. This will include surface cleanliness, the degree of sandblast and surface profiles.

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F. At a minimum of every four hours or more often when conditions change during surface preparation and coatings application, environmental conditions IE: Relative Humidity, dew-point, surface temperature and the dew-point/surface temperature depression must be measured and recorded. The use of a sling psychrometer and US weather bureau barometric chart or approved equal such as Defelsko or Elcometer test instruments shall be used to measure the environmental conditions.

G. Warranty Inspection: A warranty inspection will be conducted at the end of the one-year warranty period from the substantial completion date. The Contractor and a representative of the coating material manufacturer may attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the Owner. The Owner may, by written notice to the Contractor, reschedule the warranty inspection to another date within the warranty period.

H. Quality Assurance Responsibility: The Contractor is responsible to obtain and pay for the services of the NACE inspector referred to above.

1.5 SUBMITTALS

A. Before any paint materials are delivered to the job site, submit a complete list of all materials proposed to be furnished and applied under this Section. Include schedule of where and for what use coating materials are proposed in accordance with requirements for Product Data. Any coating or paint materials ordered by Contractor prior to receiving submittal response from Engineer indicating that the submitted material is accepted shall be at the risk of the Contractor.

B. For each paint, furnish the paint manufacturer's specific application instructions and the following information:

1. Paint manufacturer’s data sheet for each product proposed, including statements on the suitability of the materials for the intended use.

2. Surface preparation recommendations

3. Type of primer, if required

4. Maximum dry and wet mil thickness per coat

5. Minimum and maximum curing time between coats, including atmospheric conditions for each

6. Curing time before submergence in water

7. Thinner to be used with each paint

8. General ventilation requirements

9. Atmospheric conditions during which the paint is <u>not</u> to be applied

10. Allowable methods of application

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11. Maximum allowable moisture content and minimum age of plaster, concrete and wood surfaces at time of paint application

12. Compatibility of shop and field applied coatings (where applicable)

13. For coating in contact with potable water, provide NSF61 Certification

C. Reports: Submit the following to the Engineer:

1. Reports on visits to project site to view and approve surface preparation of structures to be coated.

2. Reports on visits to project site to observe and approve coating application procedures.

3. Reports on visits to coating plants to observe and approve surface preparation and coating application on items that are “shop coated.”

1.6 DELIVERY AND STORAGE

A. Deliver, store, and handle products in accordance with manufacturer’s requirements. All materials are to be delivered to the job site in their original, unopened containers bearing the manufacturer's name, brand, batch number, date of manufacture, and any special directions.

B. Only the approved material shall be stored at the job site and stored only in designated areas restricted to the storage of paint materials and related equipment. All paint is to be stored in enclosed structures and protected from weather and excessive heat or cold. Store coatings in well-ventilated facility that provides protection from the sun, weather, and fire hazards. Maintain ambient storage temperature between 45- and 90-degrees Fahrenheit, unless otherwise recommended by the manufacturer.

C. Store flammable materials to conform with State and local safety codes. Protect emulsion type paints from freezing. Take precautions to prevent fire and spontaneous combustion.

D. Materials exceeding storage life recommended by the manufacturer will be subject to rejection.

E. Remove unspecified and unapproved paints from Project site immediately

1.7 SURFACES NOT REQUIRING PAINTING

A. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, aluminum, chromium plate, and weathering steel, except where (1) required for electrical insulation between dissimilar metals, (2) aluminum is in contact with concrete or masonry, and (3) color coding of equipment and piping is required.

B. Copper, bronze, aluminum, weathering steel, and stainless steel,

C. Glass, porcelain, and plastics do not require painting.

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D. Prefinished architectural finishes such as acoustical tile, cabinets, and wall panels do not require painting.

E. Prefinished electrical items such as motor control centers, switchboards, switchgear, panelboards, transformers, and disconnect switches do not require painting.

F. Exposed electrical conduits shall be painted to match the color of the adjacent wall or equipment to which they are attached, except that non-submerged conduits attached to unpainted masonry and concrete surfaces need not be painted.

G. Exterior concrete slabs, exterior sidewalks, exterior concrete stairs and exterior concrete curbs.

H. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.

1.8 MAINTENANCE

A. Extra Materials: Include minimum 1 gallon of each type and color of coating applied. When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory. When manufacturer does not package material in gallon cans, deliver material in new gallon containers, properly sealed and identified with typed labels indicating brand, type and color.

PART 2 - PRODUCTS

2.1 PAINT AND COATING SYSTEM APPLICATIONS

A. Prepare surfaces and apply paint and coating systems in accordance with the following schedules for all surfaces.

Surface Preparation	Description
SSPC SP-1	Solvent Cleaning
SSPC SP-2	Hand Tool Cleaning
SSPC SP-3	Power Tool Cleaning
SSPC SP-5	White Metal Blast Cleaning
SSPC SP-6	Commercial Blast Cleaning
SSPC SP-7	Brush off Blast Cleaning
SSPC SP-10	Near White Blast Cleaning
SSPC SP-11	Power Tool Cleaning to Bare Metal
SSPC SP-12	High- and Ultrahigh-Pressure Water Jetting
SSPC SP-13	Surface Preparation of Concrete

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SSPC SP-16	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

Paint and Coating Application Schedule		
Surface to be Painted or Coated	Surface Preparation	Paint System
Ferrous Metal (ungalvanized), Exposed	SSPC – SP-6	System 1
Ferrous Metal (galvanized)	SSPC – SP-1	System 2
Ferrous Metal, Submerged or Buried	SSPC – SP-10	System 3
Ferrous Metal, Exposed Inside Tankage	SSPC – SP-10	System 3
Ferrous Metal, Buried (galvanized)	SSPC – SP-6	System 5
Ferrous Metal, Buried (black)	NAPF 500-03-04	System 5

2.2 PAINT AND COATING SYSTEMS

A. Furnish primers and finish coatings as shown on the following coating table schedule. If manufacturers have changed their coating products and the products shown below are no longer available, provide the product that the manufacturer recommends as the improved version of the product shown.

B. Where dry film thicknesses are not shown, the DFT shall be as recommended by the manufacturer for the product and service shown in the Application Schedules above.

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C. Paint and Coating Systems:

System	Ameron Coatings	ICI Devoe Coatings	Tnemec Company
1	Amercoat 235 Primer Amershiled Finish 2 coats, 3.0 mils each	Devguard 4160 primer Devguard 4308 finish (4550) finish 2 coats, 3.0 mils each	Tnemec 66 primer Tnemec 2H finish 2 coats, 3.0 mills each
2	SHER-CRYL HPA 2 coats, 3-4 mils each	Same as System 1 but for Devoe Coatings but use Devguard 4120 primer	Same as System 1 but pretreat galvanizing
3	SHER-GLASS FF 2 coats, 8-10 mils each	Catha-Coat 302H primer Devtar 5A finish 8.0 mils	Tnemec N69 8 mils primer Tnemec HS Epoxy 104 10 mils finish
5	Macropoxy 646FC 2 coats, 8-10 mils each	Bar Rust 235, 2 coats & 20 mils PVC Wrap	Tnemec HS Epoxy 104, 2 coats 10 mils & 20 mils PVC Wrap

2.3 OTHER COATINGS

A. Factory Applied Coatings and Touchup: Field touchup shall consist of touching up the shop prime coat to achieve the film thickness, continuity and coating specified in accordance with the paint system data sheets. Badly damaged shop coatings shall be removed and the surfaces recoated in accordance with the specified system requirements.

B. Aluminum Metal Insulation: Where aluminum surfaces come in contact with concrete or with metals not compatible with aluminum, paint the dissimilar materials with a prime coat of zinc-chromate primer or a coating of heavy-bodied bituminous paint.

C. Painting and Identification of Piping: All exposed new piping is to be painted and identified in accordance with Section 40 05 97 – Piping Identification.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Prepare all surfaces prior to application of paint or coatings. Comply with surface preparation requirements of the Society for Protective Coatings (SSPC). If the paint or coating manufacturer recommends a surface preparation different than that shown, follow the more stringent surface preparation requirement.

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B. ASTM D4259 – Wet Abrasive Blasting, Vacuum Assisted Dry Abrasive Blasting or Centrifugal Shot Abrasive Blasting

1. Shot Blasting – Before blasting fill defects and holes with filler recommended by the coating manufacturer. Blast with dustless steel shot to remove laitance, residue and loose material to roughen the surface to a texture of No. 40 to 60 grit sandpaper.

C. Surface preparation requirements of the Society for Protective Coatings (SSPC) are as follows:

1. SSPC – SP-1 – Solvent Cleaning

2. SSPC – SP-2 – Hand Tool Cleaning

3. SSPC – SP-3 – Power Tool Cleaning

4. SSPC – SP-5 – White Metal Blast Cleaning

5. SSPC – SP-6 – Commercial Blast Cleaning

6. SSPC – SP-13 – Mechanical or Chemical Cleaning

D. Preparation of Concrete and Masonry Surfaces: Unless otherwise specified, concrete surfaces which are to receive any paint coating shall be allowed to age for a minimum of 28 days. Moisture content shall be tested with a Delmhorst Instrument Company moisture detector prior to application of paint or coating. The moisture content of the concrete shall be within the limits recommended by the manufacturer of the paint or coating before any paint or coating is applied.

3.2 APPLICATION

A. Workmanship: All work shall be done in a workmanlike manner so that the finished surface will be free from runs, drips, ridges, waves, laps and unnecessary brush marks. All coats shall be applied in such a manner as to produce an even film of uniform thickness, completely coating all corners and crevices.

B. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in a first-class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Spray equipment shall be equipped with mechanical agitators, pressure gauges, and pressure regulators. Spray nozzles shall be of the proper sizes.

C. Each coat of paint shall be applied evenly and sharply cut to line. Care shall be exercised to avoid overspraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs and other adjacent areas and installation shall be protected by taping, drop cloths or other suitable measures.

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D. Paint Properties, Mixing and Thinning. All paint, when applied, shall provide a satisfactory film and smooth, even surface. Glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application, adhesion and subsequent coats. Paints shall be thoroughly stirred, strained and kept at a uniform consistency during application. Coatings consisting of two (2) or more components shall be mixed in accordance with manufacturer's instructions. Where necessary to suit conditions of the surface, temperature, weather and method of application, and with the Engineer's approval, the paint may be thinned immediately prior to use by the addition of not more than one pint per gallon of the proper thinner; provided that in no case shall the paint be reduced more than necessary to obtain the proper application characteristics. Where specifically permitted by the Specifications, certain paints may be thinned more than the maximum indicated above. Paint thinner shall be as recommended by the paint manufacturer.

E. Atmospheric Conditions: Except as specified or required for certain water-thinned paints, paints shall be applied only to surfaces that are thoroughly dry and only under such combination of humidity and temperatures of the atmosphere and surfaces to be painted as will cause evaporation rather than condensation.

1. In no case shall any paint be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation without suitable protection, as accepted by the Engineer. Where painting is permitted during damp weather or when the temperature is at or below 40 degrees F, the surfaces shall be heated to prevent moisture condensation thereof.

2. Bar metal surfaces, except those which may be warped by heat, may be dehydrated by flame-heating devices immediately prior to paint application.

3. While any painting is being done and for a period of at least eight (8) hours after the paint has been applied, the temperature of the surfaces to be painted, the painted surfaces and the atmosphere in contact therewith shall be maintained at or above 40 degrees F and 5 degrees above the dew point.

4. All paint, when applied, shall be approximately the same temperature as that of the surface on which it is applied. The use of fans or heaters shall be required in enclosed areas where conditions causing condensation are severe.

F. Method of Paint Application: Where two (2) or more coats are required, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors. Color additives shall not contain lead or any lead compound which may be destroyed or affected by hydrogen sulfide or any gas likely to be found in wastewater treatment plants.

G. Electrical and mechanical equipment, on which the manufacturer's coating is found, shall be touch-up primed and painted with two (2) coats of the specified paint system to match the color scheduled. This does not apply to electrical and instrumental equipment otherwise specified in Division 26.

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H. No paint shall be applied to any surface until it has been prepared as specified and approved by the Engineer. Unless otherwise specified, the primer or first coat of paint shall be applied by brush to ferrous surfaces. All subsequent coats for all ferrous surfaces may be either brush or spray applied. Unless stated otherwise, prime and finish coats shall be applied at the rate recommended by the manufacturer for the services involved. After prime coat is dry, all suction spots shall be touched up before succeeding coats are sprayed. All coats for concrete and masonry shall be brushed or rolled unless otherwise specified. Before painting or repainting existing surfaces, the Contractor shall test-paint a small area on the actual surface to show that the color matches the existing surfaces.

I. Unless otherwise specified, do not apply finish coats until all other work in the area is done and until the prime and intermediate coats have been inspected by the Engineer.

J. Film Thickness and Continuity: The actual surface area covered per gallon of oil and varnish vehicle paint for various types of surfaces shall not exceed those recommended by the manufacturer. All paint and coating thickness stated in this specification are dry film thickness. The first coat on metal surfaces refers to the first full paint coat and not to conditioning or other pretreatment applications. All coatings shall be applied to the thickness in accordance with these Specifications. The minimum thickness at any point shall not deviate more than 25 percent from the required average. Except as specified, no less than two (2) coats shall be applied.

K. Special Requirements: Hangers shall be painted, except for the final coat, prior to installation. Paint underside of all ungalvanized equipment bases and supports with at least two (2) coats of rust inhibiting primer prior to setting the equipment in place. Paint bolt and bolt holes in flanges, such as those used with couplings or wager type valves, where hold and bolt as finally installed will be exposed to weather or moisture, prior to assembly to prevent rusting of the unprotected metal.

3.3 FIELD INSPECTION AND TESTING

A. Where two (2) or more coats are required, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors.

B. Unless otherwise specified, do not apply finish coats until all other work in the area is done and until the underlying coats have been inspected and accepted by the NACE Inspector.

C. Film Thickness: All paint and coating thickness stated in this specification are dry film thickness. The first coat on metal surfaces refers to the first full paint coat and not to conditioning or other pretreatment applications. All coatings shall be applied to the thickness in accordance with these Specifications and the Manufacturer's recommendations as stated in the product data sheets. The dry film thickness of each coating application will be measured using the SSPA-2 standard. The minimum/maximum thickness requirements shall meet the perimeters outlined in this standard. Where the minimums and maximums do not meet the requirements of this standard, corrections must be made.

D. Continuity: Holiday testing will be performed in accordance with NACE RP0188. All surfaces below the waterline shall be tested.

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In testing for continuity, all pinholes and holidays located shall be repainted to the required dry film thickness. All ferrous metal surfaces shall meet minimum continuity requirements outlined the NACE RP0188 standard. All holiday repairs will be re-tested following the repairs.

E. It is intended that the dry film thickness and the continuity of painted ferrous metal surfaces be subject to continual field check by the Contractor's quality control subcontractor. Dry-film thickness will be measured by an Elcometer or Mikrotest magnetic type dry-film thickness gauge. Continuity will be tested by a low voltage wet sponge transistorized device, as manufactured by Tinker-Rasor (Model M-1), or equal. The Contractor's quality control subcontractor shall use inspection devices that are in good working condition for detection of holidays and measurement of dry-film thickness. The Contractor's subcontractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of dry-film thickness gauge and certified instrumentation to test accuracy of holiday detectors. Provide safe and suitable ladders or temporary scaffolding and adequate illumination to facilitate inspection.

3.4 PROTECTION OF PAINT SURFACES

A. Where protection is provided for painted surfaces, such protection shall be preserved in place until the paint film has properly dried and the removal is authorized. Items which have been painted shall not be handled, worked on, or otherwise disturbed until the paint coat is completely dry and hard.

B. After delivery at the site of materials for permanent erection or installation, all shop-coated metalwork shall be repainted or retouched from time to time, which specified paint, whenever, in the opinion of the Engineer, it becomes necessary to maintain the integrity of the film.

3.5 CLEANUP

A. Upon completion of all painting, remove all surplus materials, protective coverings and accumulated rubbish and thoroughly clean all surfaces and repair any overspray or other paint-related damage.

END OF SECTION 09 90 00

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SECTION 26 05 00 – ELECTRICAL, GENERAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to all of Division 26 Specifications. This Specification section applies to all Division 26 Specifications and Electrical Drawings.

B. Division 26 contractor shall review all other division specifications and drawings for additional requirements.

1.2 QUALITY ASSURANCE

A. Comply with latest NEC, NFPA, UBC, UFC, UL and applicable Local and State Codes. Also comply with Utility Company regulations and industry standards and these Drawings.

B. Work shall be done by only trained, licensed and experienced workmen familiar with the requirements.

C. All microprocessor based equipment and software with equipment shall utilize 4 digits for the year part of all dates. A two digit date shall be an option for printing at Owner's preference.

D. Hazardous Location Rating of Equipment: Equipment manufacturer shall reference the hazardous-area classification drawing in the Contract Documents and provide equipment in compliance with the defined NEC- classification requirements. It will be the manufacturer's sole responsibility to submit equipment in compliance with the Contract Documents, NFPA 820, and NEC requirements.

1.3 EXTENT OF DRAWINGS / SPECIFICATION

A. Drawings indicate intent and general layout of electrical systems for the Project. Drawings are partly diagrammatic and do not indicate all fittings and accessories which may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.

1.4 PRIOR APPROVALS

A. Unless directed otherwise by Division 1, all products submitted for prior approval shall be received by the Engineer 10 business days prior to Bid. Supply technical data, photometrics and dimensional Drawings showing that substitutes are equal to product specified. Faxed prior approvals will not be accepted.

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1.5 DISCREPANCIES

A. Prior to submitting Bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification. The more stringent provisions shall take precedence where codes, Specifications and Drawings differ with one another. The Contractor shall Bid the more expensive requirement, unless discrepancy is addressed by Addendum prior to Bid.

1.6 TEMPORARY LIGHTING/POWER

A. Provide temporary electrical power and lighting for all trades that require service during the course of this Project. Provide temporary service and distribution as required. Provide temporary power for all electrical equipment that will need to be installed due to the phased construction of this project. Comply with the NEC and OSHA requirements. Energy Costs by General Contractor.

1.7 SHOP DRAWING SUBMITTALS

A. General: Follow the procedures specified in Section 01 33 00 – Submittal Procedures. Submit for final and official approval through the General Contractor.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate connecting electrical service to components furnished under other Sections.

F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces.

1.9 SUBSTANTIAL COMPLETION

A. At Substantial Completion of Project, be ready to demonstrate the following list of items below. If this is not possible, inform the General Contractor and Engineer no less than 1 week prior to Engineer's visitation of the site for Substantial Completion.

B. Demonstrate the operation and test of the emergency lighting system.

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C. Demonstrate the main service ground, bonding to neutral and resistance readings obtained at time of installation. This will involve having some covers removed from the main panels at the time of the Engineer's visitation.

D. All electrical systems and items specified shall be installed and operational.

E. Demonstrate exterior lighting controls.

F. Demonstrate the operation of all emergency power systems including generators, uninterruptible power supplies and inverter systems.

1.10 RECORD DOCUMENTS

A. Prepare Record Documents in accordance with the requirements in Section 01 77 00 – Closeout Procedures. In addition to the requirements specified in Division 1, indicate the following installed conditions:

B. Actual location of all electrical service gear/feeders, panel/motor/special equipment feeders, all major underground or underslab conduits, all conduit stubs for future use, any change in branch circuitry from Drawings, key junction boxes and pull boxes not indicated on Drawings, any control locations or indicator lights not shown on Drawings.

C. Addendum items, Change Order items and all changes made to Drawings from Bidding phase through to Project completion.

D. Actual equipment and materials installed. Where manufacturer and catalog number are indicated on Drawings, generally or in fixture or equipment schedules, change to reflect actual products installed.

E. Change service panel and branch panel breaker locations and schedules to reflect actual installed conditions.

1.11 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Section 01 77 00 – Closeout Procedures. In addition to the requirements specified in Division 1 assemble O & M Manuals as follows:

1. Compile Operating and Maintenance Manuals for the electrical systems and equipment. The manuals shall be provided to the Engineer for approval complete and at one time, prior to requesting final payment. Partial or separate data will be returned for completion.

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2. Manuals shall be assembled in three-ring binders. Binders shall be 3 inch thick or less and have slip sleeve jacket on binder side and front. More than one binder shall be used for each set of data if required to prevent overfilling of one binder. All information shall be arranged in Sections and each Section shall have a blank buff colored, heavy paper divider with a protruding tab clearly labeled. Sections shall be arranged in the same order that the equipment is listed in the Specification and each Specification section shall have a separate tab. Shop Drawings which are larger than 8-1/2-inch by 11 inch shall be individually folded so they are 8-1/2-inch by 11 inch or less and inserted behind the appropriate tab.

3. Tabs shall be labeled and arranged as follows:

   a. Index: Furnish under the first tab an index of Sections listing name of Section and Specification numbers.

   b. Equipment Manufacturers: Furnish under the second tab a complete typed list of equipment suppliers and manufacturers representative including type of equipment, name, address and phone number. The company listed here should be the one which could furnish replacement parts and offer technical information about the equipment.

   c. Product Literature: Each tab, starting with the third shall contain the name of a Specification Section. Behind each tab shall be the previously submitted and approved Shop Drawing, factory published operation and maintenance instructions and parts lists. Also include description of function, normal operating characteristics and limitations, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions. Servicing instructions and lubrication charts and schedules.

4. Upon completion and approval of the booklets, one copy shall be given to the Architect, and two to the Owner. Using the booklet, the Electrical Contractor shall explain in detail and instruct the Owner's operating personnel in the correct operation and maintenance of the equipment.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.

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1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.

2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels and are from the same manufacturer.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"- type hangers.

D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 CONCRETE EQUIPMENT BASES

A. Forms and Reinforcing Materials: As specified in Section 03 30 00 – Cast-In-Place Concrete.

B. Concrete: 3000 psi, 28-day compressive strength as specified in Section 03 33 00 – Cast-In-Place Concrete.

C. RACEWAY AND CABLE LABELS

D. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.

2. Legend: Indicates voltage.

E. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

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F. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

G. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

H. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.

2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.

4. Printed legend indicating type of underground line.

I. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

2.3 NAMEPLATES

A. Engraved Plastic Nameplates: Engraving stock, melamine plastic laminate, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.

1. Engraved legend with white letters on black face.

2. Punched or drilled for mechanical fasteners.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16-inch.

2. Tensile Strength: 50 lb minimum.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.

2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.

3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.

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4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Give right of way to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING METHODS

A. Damp Locations and Outdoors: Hot-dip galvanized materials, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Conform to manufacturer's recommendations for selecting supports.

E. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200 lb minimum design load.

3.3 GENERAL INSTALLATION OF MATERIALS

A. Install wires according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Conductor Splices: Keep to the minimum and comply with the following:

1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

2. Use splice and tap connectors that are compatible with conductor material.

C. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

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D. Install devices to securely and permanently fasten and support electrical components.

E. Raceway Supports: Comply with NFPA 70 and the following requirements:

1. Conform to manufacturer's recommendations for selecting and installing supports.

2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.

5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.

6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.

7. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports in accordance with NEC.

8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.

F. Vertical Conductor Supports: Install simultaneously with conductors.

G. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

H. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

I. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:

1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.

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2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.

3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.

4. In partitions of light steel construction use sheet-metal screws.

5. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.

6. Drill holes in concrete so holes more than 3/4-inch deep do not cut main reinforcing bars.

7. Fill and seal holes drilled in concrete and not used.

8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

J. Install concrete pads and bases where indicated.

K. Install utility-metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by company.

3.4 LABEL INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.

2. Prime surfaces using type of primer specified for surface.

3. Apply one intermediate and one finish coat of enamel.

F. Color Identification of Junction boxes: Identify with spray paint. Apply colors as follows:

1. Emergency lighting and power: Orange.

2. Mechanical/Electrical Supervisory System: Blue

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3. Security System: Yellow.

G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

H. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Permanent black marker indicating panel and circuit designation.

2. Concealed Boxes: Permanent black marker indicating panel and circuit designation.

I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

J. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:

1. 208/120-V Conductors:

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

d. Neutral: White.

e. Ground: Green.

2. 480/277-V Conductors:

a. Phase A: Brown.

b. Phase B: Orange

c. Phase C: Yellow.

d. Neutral: Gray.

e. Ground: Green.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

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a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1 inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

K. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.

2. Tag Fasteners: Nylon cable ties.

3. Band Fasteners: Integral ears.

L. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.

3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

M. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

N. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2 inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.

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2. Access doors and panels for concealed electrical items.

3. Electrical switchgear and switchboards.

4. Emergency system boxes and enclosures.

5. Disconnect switches.

6. Enclosed circuit breakers.

7. Motor starters.

8. Push-button stations.

9. Power transfer equipment.

10. Contactors.

11. Remote-controlled switches.

12. Control devices.

13. Transformers.

14. Battery racks.

15. Power-generating units.

O. For panelboards, provide framed type circuit schedules with identification of items controlled by each breaker. Indicate room numbers of items controlled or room name where appropriate for Owners convenience. Final schedules shall be typed or printed for clarity. Hand written schedules are not acceptable. Schedules shall be posted inside each panel door mounted in transparent card holder upon project completion.

END OF SECTION 26 05 00

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SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes wires, cables and connectors for power, lighting, signal, control and related systems rated 600 V and less.

1.2 SUBMITTALS

A. Furnish in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers complying with the Quality Assurance requirements are acceptable.

2.2 WIRES AND CABLES

A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.

B. Power Conductors: Provide solid conductors for power and lighting circuits No. 10 AWG and smaller. Provide stranded conductors for sizes No. 8 AWG and larger.

C. Control Conductors: Provide stranded conductors.

D. Conductor Material: Copper for all wires and cables. Aluminum conductors are not acceptable.

E. Insulation: Provide THHN/THWN insulation for all conductors size 500 kcmil and larger, and No. 8 AWG and smaller. For all other sizes provide THW, THHN/THWN or XHHW insulation as appropriate for the locations where installed. Type THHN insulation may be used for branch circuit and feeder sizes for 100 amp under. Adjust conduit size.

F. Color coding for phase identification in accordance with Section 26 05 00 –Electrical, General.

2.3 CONNECTORS FOR CONDUCTORS

A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

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PART 3 - EXECUTION

3.1 WIRING METHOD

A. Use the following wiring methods as indicated:

1. Wire: Install all wire in raceway, minimum size for light and power circuits shall be #12 AWG. Minimum size for control wire shall be 14 AWG.

3.2 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and connectors in compliance with NEC.

B. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.

C. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. No joints or taps permitted in service or feeder circuits.

D. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 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.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

1.2 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 05 19 – Low-Voltage Conductors and Cables.

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.

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2. Assembly of Stranded Conductors: ASTM B 8.

H. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4-inch in diameter.

2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16-inch thick.

4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 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.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Sectional type; copper-clad steel.

1. Size: 3/4 inch in diameter by 120 inches in length.

PART 3 - EXECUTION

3.1 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 equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

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F. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 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. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.

2. Lighting circuits.

3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

7. Armored and metal-clad cable runs.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

E. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

F. Water Heater: Bond conductor to heater units, piping, connected equipment, and components.

G. Signal and Communication Systems: Provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

H. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.

1. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

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3.3 INSTALLATION

A. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NEC. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation. Bond grounding conductor by cadweld process to reinforce steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

B. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 6 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

C. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

E. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

H. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.4 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.

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1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

3.5 FIELD QUALITY CONTROL

A. Test ground resistance of entire system and at each building/structure where electrical equipment is installed.

B. Where maximum allowable ground resistance of 5 ohms is exceeded, install additional grounding mats or ground rods until ground resistance is equal to or below maximum allowable ground resistance.

END OF SECTION 26 05 26

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SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways for electrical wiring. Types of raceways in this Section include only the following:

1. Electrical metallic tubing (EMT).
2. Flexible metal conduit.
3. Intermediate metal conduit.
4. Liquidtight flexible metal conduit.
5. Rigid metal conduit.
6. Rigid nonmetallic conduit.
7. Wiremold.
8. Wireway.

1.2 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers complying with the Quality Assurance requirements are acceptable.

2.2 METAL CONDUIT AND TUBING

A. Rigid Metal Conduit (RMC): ANSI C80.1.

B. Intermediate Metal Conduit (IMC): UL 1242.

C. Electrical Metallic Tubing (EMT) and Fittings: ANSI C80.3.

D. Flexible Metal Conduit: UL 1, zinc-coated steel.

E. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

F. PVC Coated Metal Conduit:

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1. Use PVC Coated Rigid Metal Conduit and fittings in all wet and hazardous areas.

    a. PCS:

        1) The steel conduit, before PVC coating, shall be new, unused, hot-dip galvanized material, conforming to the equipment for Type GRC.

        2) Coated conduit NEMA Standard RN-1

        3) The galvanized coating may not be disturbed or reduced in thickness during the cleaning and preparatory process.

    b. Factory-bonded PVC jacket:

        1) The exterior galvanized surfaces shall be coated with primer before PVC coating to ensure a bond between the zinc substrate and the PVC coating.

        2) Nominal thickness of the exterior PVC coating shall be 0.040 inch except where part configuration or application of the piece dictates otherwise.

        3) PVC coating on conduits and associated fittings shall have no sags, blisters, lumps, or other surface defects and shall be free of holes and holidays.

        4) The PVC adhesive bond on conduits and fittings shall be greater than the tensile strength of the PVC plastic coating:

            I. Confirm bond with certified test results.

    c. A urethane coating shall be uniformly and consistently applied to the interior of all conduits and fittings:

        1) Nominal thickness of 0.002 inch

        2) Conduits having areas with thin or no coating are not acceptable

        3) All threads shall be coated with urethane.

    d. The PVC exterior and urethane interior coating applied to the conduits shall afford sufficient flexibility to permit field bending without cracking or flaking at temperature above 30 degrees Fahrenheit (-1 degree Celsius).

    e. PCS conduit bodies and fittings:

        1) Malleable iron

        2) The conduit body, before PVC coating, shall be new, unused material and shall conform to appropriate UL standards.

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3) The PVC coating on the outside of conduit bodies shall be 0.040 inch thick and have a series of ribs to protect the coating from tool damage during installation

4) 0.002-inch interior urethane coating.

5) Utilize the PVC coating as an integral part of the gasket design.

6) Stainless steel cover screw heads shall be encapsulated with plastic to ensure corrosion protection.

7) A PVC sleeve extending 1 conduit diameter or 2 inches, whichever is less, shall be formed at each female conduit opening.

I. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used.

II. The sleeve shall provide a vapor- and moisture-resistant seal at every connection.

f. Interlocking design formed from continues metal strip for integrity and flexibility

g. Manufactured in accordance with:

1) UL-1

2.3 NONMETALLIC CONDUIT AND DUCTS

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 80 PVC.

B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. Liquidtight Flexible Nonmetallic Conduit and Fittings: UL 1660. Fittings shall be specifically approved for use with this raceway.

D. Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.

E. Electrical Nonmetallic Tubing (ENT): Is not allowed.

2.4 CONDUIT BODIES

A. General: Types, shapes, and sizes as required to suit individual applications and NEC requirements.

B. Provide matching gasketed covers secured with corrosion-resistant screws.

C. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.

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2.5 WIREWAYS

A. General: Electrical wireways shall be of types, sizes, and number of channels as indicated. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway as required for complete system.

B. Where features are not indicated, select to fulfill wiring requirements and comply with applicable provisions of NEC.

2.6 SURFACE RACEWAYS

A. General: Sizes and channels as indicated. Provide fittings that match and mate with raceway.

B. Surface Metal Raceway: Construct of galvanized steel with snap-on covers, with 1/8-inch mounting screw knockouts in base approximately 8 inches o.c. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required.

C. PVC coated rigid shall be provided in the areas that have process equipment, moisture or susceptible to moisture. Conditioned areas such as electrical room, office and restroom where conduit is concealed in the wall. EMT is acceptable.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Outdoors: Use the following wiring methods:

1. Exposed: PVC coated rigid metal conduit, elbows to be PVC coated RMC.

2. Concealed: Rigid metal conduit, elbows to be PVC coated RMC.

3. Underground: Rigid nonmetallic conduit (sched 80), elbows to be PVC coated RMC.

4. Indoors or Outdoors: Connection to vibrating equipment including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment in moist or humid location or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: liquid tight flexible metal conduit.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: flexible metal conduit.

2. Exposed: Electrical metallic tubing, rigid metal conduit.

3. Concealed: Electrical metallic tubing. AC/MC cable NOT ALLOWED.

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4. Underslab: Sch 80 PVC, elbows to be PVC coated RMC.

C. Hazardous Locations

1. As required by the NEC

3.2 INSTALLATION

A. General: Install electrical raceways in accordance with requirements of NEC, and as follows:

B. Conceal Conduit and EMT, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.

C. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.

D. Complete installation of electrical raceways before starting installation of conductors within raceways.

E. Provide supports for raceways as specified in Specification Section 26 05 00 – Electrical, General.

F. Prevent foreign matter from entering raceways by using temporary closure protection.

G. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

H. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

I. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For rigid metal conduit and intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated. EMT set screw connectors and couplers are to be steel.

J. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

K. Raceways embedded in slabs: Not allowed without engineering approval.

L. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.

M. Run exposed, parallel, or banked raceways together.

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N. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

O. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

P. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

Q. Install pull wires in empty raceways. Use monofilament plastic line having not less than 200 lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

R. Communication and Signal System Raceways 2 Inch Trade Size and Smaller: In addition to the above requirements, install raceways 2 inch and smaller trade size in maximum lengths at 150 feet and with a maximum of two, 90 deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

S. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver operated threaded flush plugs flush with floor.

T. Flexible Connections: Use short length (maximum of 6 ft.) 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 locations. Install separate ground conductor across flexible connections.

U. Surface Metal Raceway: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.

V. Raceway Installed Above Accessible Ceilings: Raceway located above accessible ceilings shall be a minimum of 24 inches above finished ceiling or mounted direct to structure, whichever is less.

3.3 ADJUSTING AND CLEANING

A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION 26 05 33

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SECTION 26 21 00 - SERVICE ENTRANCE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Coordinate existing incoming power service with Local Power Utility Company.

B. Verify exact location of service feeds and transformers with Avista Utilities. Existing service to be maintained. Any and all power shut downs shall be scheduled and coordinated with the owner and related trades.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Install, modify or demolish service-entrance equipment as indicated on the plans. New equipment to be installed, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC, UL, ANSI, IEEE, and NEMA standards.

B. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the NEC.

END OF SECTION 26 21 00

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

1. Branch-circuit panelboards.

2. Distribution panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.

b. Bus configuration, current, and voltage ratings.

c. Short-circuit current rating of panelboards and overcurrent protective devices.

d. UL listing.

e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing. Scheduling shall be typewritten indicating loads served by each breaker.

D. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:

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1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 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.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.6 EXTRA MATERIALS

A. Keys: Six spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. General Electric Co.; Electrical Distribution & Control Div.

b. Siemens Energy & Automation, Inc.

c. Square D Co.

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush or Surface mounted cabinets as indicated. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Utility meter included with panel.

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3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with piano hinged door in door trim. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

E. Bus: Copper.

F. Main and Neutral Lugs: Compression type suitable for use with conductor material.

G. Equipment Ground Bus: Copper only Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

H. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

J. Gutter Barrier: Arrange to isolate individual panel sections.

K. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

L. Feed-through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals, unless otherwise stated. Series rating not allowed.

2.4 LOAD CENTERS - NOT ALLOWED.

2.5 BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

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2.6 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panelboards: Stub three 3/4-inch (19 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 3/4-inch (19 mm) empty conduits into raised floor space or below slab not on grade.

G. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 00 – Electrical, General.

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

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3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, section 7.5 for switches and section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

B. Balancing loads between phases such that difference is below 20 percent.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 16

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SECTION 26 28 00 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes overcurrent protective devices (OCPDs) rated 600 V and below and switching devices commonly used with them.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

B. Product data for fuses, fusible switches, circuit breakers, and OCPD accessories specified in this Section, including descriptive data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cartridge Fuses:
    a. Bussmann Div., Cooper Industries, Inc.
    b. Gould Inc.
    c. Littelfuse Inc.
2. Fusible Switches:
    a. General Electric Co.
    b. Square D Co.
    c. Siemens
    d. Eaton
3. Molded-Case Circuit Breakers:
    a. General Electric Co.
    b. Square D Co.
    c. Siemens

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d. Eaton

4. Combination Circuit Breaker and Ground Fault Circuit Interrupters:

a. General Electric Co.

b. Square D Co.

c. Siemens

d. Eaton

5. Molded-Case Circuit Breakers With Solid-State Trip Devices:

a. General Electric Co.

b. Square D Co.

c. Siemens

d. Eaton

2.2 OVERCURRENT PROTECTIVE DEVICES (OCPD'S), GENERAL

A. General: Provide OCPD's in indicated types, as integral components of panelboards, switchboards, and also as individually enclosed and mounted single units.

B. Enclosures: NEMA 250 "Enclosures for Electrical Equipment (1,000 Volts Maximum)."

2.3 CARTRIDGE FUSES

A. General: NEMA Standard FU1, "Low-Voltage Cartridge Fuses." Unless indicated otherwise, provide nonrenewable cartridge fuses of indicated types, classes, and current ratings that have voltage ratings consistent with the circuits on which used.

B. Class RK1 and RK5 Dual Element Time-Delay Fuses: UL 198E, "Class R Fuses."

2.4 FUSIBLE SWITCHES

A. General: UL 98 "Enclosed and Dead Front Switches" and NEMA KS 1 "Enclosed Switches," quick-make, quick-break heavy-duty units.

B. Rating: Load-breaking capacity in excess of the normal horsepower rating for the switch.

C. Withstand Capability: In excess of the let-through current permitted by its fuse when subject to faults up to 100,000 RMS symmetrical amperes.

D. Operation: By means of external handle.

E. Interlock: Prevents access to switch interior except when in "off" position.

F. Fuse Clips: Rejection type.

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G. Padlocking Provisions: For 2 padlocks, whether open or closed.

H. Enclosure for Independent Mounting: NEMA Type 1 enclosure except as otherwise indicated or required to suit environment where located.

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. General: UL 489, "Molded Case Circuit Breakers and Circuit Breaker Enclosures," and NEMA AB 1, "Molded Case Circuit Breakers."

B. Construction: Bolt-in type, except breakers 225-ampere frame size and larger may be plug-in type if held in place by positive locking device requiring mechanical release for removal.

C. Characteristics: Indicated frame size, trip rating, number of poles, and a short-circuit interrupting capacity rating of 10,000 amperes symmetrical, unless a greater rating as indicated.

D. Tripping Device: Quick-make, quick-break toggle mechanism with inverse-time delay and instantaneous overcurrent trip protection for each pole.

E. Adjustable Instantaneous Trip Devices: Factory adjusted to low-trip-setting current values.

F. Enclosure for Independent Mounting: NEMA Type 1 enclosure, except as otherwise indicated or required to suit environment where located.

G. Combination Circuit Breakers and Ground Fault Circuit Interrupters: UL 943 "Ground Fault Circuit Interrupters," arranged for sensing and tripping for ground fault current in addition to overcurrent and short-circuit current. Provide features as follows:

1. Match features and module size of panelboard breakers and provide clear identification of ground fault trip function.

2. Trip Setting for Ground Fault: 30 milliamperes.

2.6 OCPD ACCESSORIES

A. Shunt-Trip Devices for Circuit Breakers: Where indicated, arrange to trip breaker from an external source of power through a control switch or relay contacts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Independently Mounted OCPD's: Locate as indicated and install in accordance with manufacturer's written installation instructions.

B. OCPD's in distribution equipment shall be factory installed.

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3.2 CONNECTIONS

A. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field-connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

3.3 GROUNDING

A. Provide equipment grounding connections for individually mounted OCPD units as indicated and as required by NEC. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

3.4 FIELD QUALITY CONTROL

A. Visual and mechanical inspection: Include the following inspections and related work.

1. Overcurrent-Protective-Device Ratings and Settings: Verify indicated ratings and settings to be appropriate for final system arrangement and parameters. Where discrepancies are found, test organization shall recommend final protective device ratings and settings. Use accepted revised ratings or settings to make the final system adjustments.

2. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current single line diagram.

3. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

4. Check tightness of electrical connections of OCPD's with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

5. Clean OCPD's using manufacturer's approved methods and materials.

B. Retest: Correct deficiencies identified by tests and observations and provide retesting of OCPD's. Verify by the system tests that specified requirements are met.

3.5 CLEANING

A. Upon completion of installation, inspect OCPD's. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 26 28 00

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SECTION 26 29 13.13 - ACROSS-THE-LINE-MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes A.C. motor control devices rated 600 V and below that are not supplied as an integral part of a motor control center.

B. Related Sections include the following:

1. Section 26 05 00 – Electrical, General for general materials, installation methods, and labeling.

1.3 SUBMITTALS

A. Product data for products specified in this Section. Include dimensions, ratings, and data on features and components.

B. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

C. Load Current and Overload Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

B. Comply with NFPA 70, UL, and NEMA.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed and Labeled”: As defined in the National Electrical Code, Article 100.

1.5 COORDINATION

A. Coordinate features of controllers and control devices with pilot devices and control circuits provided under Divisions 23, 40 – 46 Sections covering control systems.

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1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare Fuses and Incandescent Indicating Lamps: Furnish 1 spare for every 5 installed units, but not less than 1 set of 3 of each kind.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Eaton

2. Allen-Bradley Co.; Industrial Control Group.

3. General Electric Co.; Electrical Distribution & Control Div.

4. Square D Co.

2.2 MANUAL MOTOR CONTROLLERS

A. Description: NEMA ICS 2, general purpose, Class A with toggle action and overload element.

2.3 MAGNETIC MOTOR CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V. Provide control power transformer integral with controller where no other supply of 120 V control power to controller is indicated. Provide control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory assembled with controller and arranged to disconnect switch with or without overcurrent protection as indicated.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a nationally recognized testing laboratory.

D. Electronic Overload Relay: Assembly designed to meet the following minimum requirements:

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1. NEMA ICS 2, Class 10 tripping characteristics selected to protect motor against voltage unbalance and single phasing.

2. Control Module shall be provided with a minimum of four (4) Inputs and three (3) Relay Outputs.

3. Sensing Module shall be capable of voltage protection, power protection and voltage, power, and energy monitoring.

4. Communication Module providing Ethernet/IP with (2) RJ45 ports that can support a star, linear and ring topologies. Additional functionality shall include:

5. Two (2) concurrent Class 1 connections. (One (1) exclusive owner and one (1) listen only)

6. Six (6) simultaneous Class 3 connections. (Explicit messaging)

7. Embedded EDS file.

8. Studio 5000 Add-on Profile

9. Autotransformer Reduced-Voltage Controller: NEMA ICS 2, closed transition.

E. Overload Relay: NEMA ICS 2, Class 10 tripping characteristics selected to protect motor against voltage unbalance and single phasing.

2.4 ENCLOSURES

A. Description: Flush or surface mounted cabinets as indicated. NEMA 250, Type 12, unless otherwise indicated to comply with environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2.5 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.

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F. Current-Sensing, Phase-Failure Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

PART 3 - EXECUTION

3.1 APPLICATION

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.

D. Use manual controllers for 3-phase motors up to 5 hp not requiring automatic or remote control.

E. Pushbutton Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with sealing auxiliary contact for low-voltage protection.

F. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor-control devices according to manufacturer’s written instructions.

B. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.

C. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks .

D. Install freestanding equipment on concrete housekeeping bases conforming to Section 26 05 00 – Electrical, General.

E. Motor-Controller Fuses: Install indicated fuses in each fusible switch.

3.3 IDENTIFICATION

A. Identify motor control components and control wiring in accordance with Section 26 05 00 – Electrical, General.

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3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor control devices in accordance to Division 26 Section "Wires and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic control devices where available.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5, 7.6, and 7.16. Certify compliance with test parameters.

2. Remove and replace malfunctioning units with new units, and retest.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, comply with tightening torques specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NeTA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.

2. Remove and replace malfunctioning units with new units, and retest.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

END OF SECTION 26 29 13.13

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SECTION 26 32 13 – ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Extent of engine generator set Work is indicated by drawings and is hereby defined to include, but not by way of limitation, engines, electrical generators, engine starting systems including batteries, instrument control panel, transfer switches, annunciator panel, exhaust silencer, and accessories required for a complete generator installation.

B. Generator set required for the project is a natural gas-driven unit.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data on engine-driven generator sets and components. Submit wiring diagrams for engine-driven generator units showing connections to electrical power panels, feeders, automatic transfer switches, and ancillary equipment. Differentiate between portions of wiring that are manufacturer-installed and portions that are field-installed.

B. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Section 26 05 00 – Electrical, General. Include complete Operations and Maintenance Manual, Illustrated Parts List and Maintenance Schedule.

C. Certifications: Provide engine-driven generator sets certified test record of the following final production testing:

1. Single-step load pickup.

2. Transient and steady state governing. The generator will serve loads controlled by VFD’s. Manufacturer shall take appropriate measures. Refer to drawings for loads served.

3. Safety shutdown device testing.

4. Voltage regulation.

5. Rated power.

6. Maximum power.

D. Provide certified test record prior to engine-driven generator set being shipped from factory to project location.

E. Unit Responsibility: The complete standby emergency generator systems are to be tested under full load conditions, as a unit, before being shipped to the job site from factory. Installation and hook-up to be under direct supervision of factory trained personnel.

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F. The automatic transfer control shall be supplied per specification Section 26 36 00 – Transfer Switches and integrated with the engine-generator.

G. Generator support shall be a factory authorized service center located within a 200 mile radius of the project site.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver engine-driven generator properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for engine-generator and components that protect equipment from damage.

B. Store engine-driven generator equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle engine-driven generator equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering natural gas generator sets which may be incorporated in the Work include the following:

1. Generac SG035KW; 120/240 V, 3 ph.

B. Generator Sets

1. General: Except as otherwise indicated, provide manufacturer's standard engine-driven generator sets and auxiliary equipment as indicated by published product information, and as required for a complete installation.

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2. Engine-Driven Generator: Provide packaged electrical power engine-driven generator assembly unit rated as indicated on drawings, at a governed speed of 1800 RPM, and rated 80 percent power factor for continuous operation, 240/120 volt, 3-phase, 4-wire, 60 Hz, at installed altitude (verify altitude), at 110 deg. F. Equip generator with a turbo-charged, 1800 RPM, engine, and fueled as noted; liquid cooled. Engine shall meet all EPA Tier level requirements at time engine is manufactured. Provide unit-mounted radiator, blower fan, water pump, and thermostat. Connect engine drive directly to 4-pole revolving-field type single, maintenance-free, bearing generator through semi-flexible steel disk coupling; equip set with associated control equipment to automatically start engine, transfer load to standby power upon failure of normal power source, transfer load back to normal power upon its restoration, and stop engine. Actual temperature rise measured by resistance method at full load shall not exceed 125 degrees Centigrade. Cushion-mount engine-generator on heavy steel base with spring type vibration isolators to reduce possibility of torsional vibration. Provide water-cooled type engine with unit-mounted radiator. Equip engine with low-oil pressure, high-water temperature, and automatic overspeed safety shutdown devices. Equip generator with exciter and voltage regulator to maintain voltage within 2 percent of rated value. Direct-connect generator to fly wheel by semi-flexible steel disk coupling. Provide unit capable of voltage recovery, within regulated range, of 7 seconds following sudden load increase from 0 to 100 percent of rated load, and with voltage dip not to exceed 35 percent upon application of rated load at rated power factor. Construct unit in compliance with applicable standards; and with additional construction features as indicated:

   a. Motor Starting Accessories: The generator will be used to feed motor loads that are controlled via variable frequency drives. Provide items for improved motor starting and generator regulation such as permanent magnet generator end, electronic governor, voltage regulators, etc..

   b. Starting System: Provide engine-generator units with 24-volt, 3-wire, negative ground, starting systems including 24-volt positive engagement solenoid shift-starting motors, batteries and 35-ampere, or greater, automatic battery charging alternators with solid-state voltage regulation.

   c. Instrument Control Panel: Provide engine-generator units with engine oil-pressure and water-temperature indicators, battery charge-rate ammeter, START - STOP switch for manual operation of unit, reset circuit breaker, static voltage regulator, voltage-adjusting rheostat, voltmeter, ammeter with phase selector switch with an OFF position, and with running time indicator and frequency meters. Select type circuitry of plug-in design capable of quick replacement, and of accepting a plug-in device that allows maintenance to test control panel performance without operating the engine.

   d. Controller: Provide a set mounted controller that complies with applicable NFPA standards. Controller shall provide all indicators, alarms, and monitoring functions that a Cummins Power Command Control 2100 provides per NFPA 110 level one requirement. Controller shall be accessible without the use of ladders, steps, etc.

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e. Connection to Data Link: Provide a modbus connection to SCADA. The controls shall have the ability to communicate in a common protocol with the programmable logic controller for the following:

1) Engine high-temperature shutdown.

2) Lube-oil low-pressure shutdown.

3) Overspeed shutdown.

4) Remote emergency-stop shutdown.

5) Engine high-temperature pre-alarm.

6) Lube-oil low-pressure pre-alarm.

7) Fuel tank, low-fuel level.

8) Low coolant level.

9) Over crank shutdown.

10) Coolant low-temperature alarm.

11) Control switch not in auto position.

12) Battery-charger malfunction alarm.

13) Battery low-voltage alarm.

f. Provide hardwired dry contact connection to SCADA for the following signals:

1) Generator Running

2) Generator Fault

3) Generator not in Auto.

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2.2 ENGINE-GENERATOR SET ACCESSORIES

A. Provide factory-fabricated automatic load-transfer switch control, mated to generator to automatically start generator unit when line voltage drops to 70 percent normal value, transfer load to generator, and transfer load back to normal source when voltage is restored to 90 percent normal, and when line voltage reaches 115% rated voltage, restoring at 100% rated voltage. Equip electrically operated, mechanically held, and electrically and mechanically interlocked, transfer switch with limiter that opens starting circuit after 45 seconds when engine fails to start. Also provide time-delay features to prevent excessive transfer and retransfer operation during momentary line voltage dips, load retransfer, and engine shutdown. Equip unit with indicator for starting, test switch for manual simulation of power outages including standby unit operation and load transfer, and time-clock exerciser circuit for automatic periodic exercise under load of engine-generator unit. Provide 120V control circuit for control of louvers. Provide service rated main circuit breaker mated to generator. Breaker shall be accessible without the use of ladders, steps, etc.

B. Provide battery rack, battery warmers, battery cables, 12-volt battery(ies) capable of delivering the minimum cold-cranking amps required at zero degrees Fahrenheit per SAE Standard J-537.

C. Provide gas proof, seamless, stainless steel, flexible exhaust connector.

D. Provide flexible fuel line(s) rated 300 degrees F and 100 PSI ending in pipe thread.

E. Provide engine exhaust silencer, coated to be temperature and rust resistant, rated for critical applications 35dB reduction. Exhaust silencer to be housed inside of weatherproof enclosure.

F. Provide block heater of proper wattage and voltage, thermostatically controlled to maintain engine coolant at 90 degrees Fahrenheit (32 degrees Celsius). The block heater shall be installed with shut-off valves for maintenance. Valves to be field installed.

G. Provide 10-ampere automatic float and equalize battery charger with +/- 1% constant voltage regulation from no load to full load over +/- 10% AC input line variation, current limited during engine cranking and short circuit conditions, temperature compensated for ambients from -40 degrees C to +60 degrees C, 5% accurate voltmeter and ammeter, fused, reverse polarity and transient protected.

H. Provide a U.L. 142 label double wall sub base fuel tank of adequate capacity to operate generator 24 hours at full load and meet the requirement for 110% fuel tank volume containment. Tank shall be of steel construction and installed under the generator. Provide Sub Base Tank to include C Channel or I beam welded beneath the tank spaced 40 inches apart to accept neoprene pads between support beams and concrete floor. Tank shall be equipped with normal and emergency venting. Provide all necessary piping for a complete venting system. Venting shall comply with applicable requirements of IFC. Tank openings and overflow protection shall comply with IFC. Tank to be equipped with supply/return lines installed to engine, low fuel level switch, leak detection, and tank heater. Install tank and accessories per applicable codes, standards, and manufacturers requirements.

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I. Provide U.L listed weatherproof sound attenuated (79dB at 23 feet) housing. Housing to be finished inside and out with a rust-inhibiting primer, and then a top coat paint. Side panels to be removable for maintenance and lockable. Provide necessary louvers and exhaust silencer connections.

J. Provide Generac Level 2 sound attenuated enclosure with motorized dampers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which natural gas engine-driven generator units are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION OF NATURAL GAS ENGINE-DRIVEN GENERATOR SETS

A. Install engine-driven generator unit as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator unit fulfills requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.

B. Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.

D. Align shafts of engine and generator within tolerances recommended by engine-generator unit manufacturer.

E. Contractor or Owner to fill tank prior to testing.

3.3 GROUNDING

A. Provide equipment grounding connections for natural gas-driven generator units as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

3.4 FIELD QUALITY CONTROL

A. Provide manufacturer-standard 5-year warranty.

B. Start-up Testing

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1. Engage local equipment manufacturer's representative to perform start-up and load tests upon completion of installation, with the Engineer in attendance; provide certified test record. Tests are to include the following:

    a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.

    b. Test, prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode.

    c. Check, during start-up test mode, for normal and emergency line-to-line voltage and phase rotation.

    d. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shutdown. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency. All tests shall be conducted with generator under full (100%) load. Full load test shall be minimum 4 hours under full load.

2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning unit at site, then retest to demonstrate compliance; otherwise, remove and replace with new unit, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.

3. Upon completion of all tests and Owner acceptance, Contractor to top off fuel tank.

3.5 PERSONNEL TRAINING

A. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating natural gas engine-driven generator sets. In addition, train Owner's personnel in periodic maintenance of batteries.

END OF SECTION 26 32 13

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SECTION 26 36 00 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces for the area/location installed.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, Section 01 78 23 - Operation and Maintenance Data, include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a 100 mile radius of project location. Provide manufacturer-standard 5-year warranty.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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C. Source Limitations: Obtain automatic transfer switches through one source from a single manufacturer.

D. 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.

E. Comply with NEMA ICS 1 – Industrial Control and Systems: General Requirements.

F. Comply with NFPA 70 – National Electric Code.

G. Comply with NFPA 110 – Standard for Emergency and Standby Power Systems.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:

a. Generac, TX Series; 200 amp, 120/208 V, 3 phase

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

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F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.

2. Switch Action: Double throw; mechanically held in both directions.

3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

H. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 16050 "Electrical Identification."

K. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated/required.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

B. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

C. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

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G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

I. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

5. Test Switch: Simulate normal-source failure.

6. Switch-Position Pilot Lights: Indicate source to which load is connected.

7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

   a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

   b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

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9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

11. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.

    b. Push-button programming control with digital display of settings.

    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details.

B. Identify components according to Section 26 05 00 – Electrical, General.

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 26 05 26 – Grounding and Bonding for Electrical Systems.

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C. Connect wiring according to Section 26 05 19 – Low-Voltage Power Conductors and Cables.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.

2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.

b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.

c. Verify that manual transfer warnings are properly placed.

d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

b. Simulate loss of phase-to-ground voltage for each phase of normal source.

c. Verify time-delay settings.

d. Verify pickup and dropout voltages by data readout or inspection of control settings.

e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

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f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.

g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

B. Coordinate this training with that for generator equipment.

END OF SECTION 26 36 00

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SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior lighting fixtures, lamps, ballasts, poles standards, and accessories.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, poles, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features, poles, accessories, and the following:

1. Outline Drawings of fixtures and poles indicating dimensions and principal features.

2. Electrical ratings and photometric data with certified results of laboratory tests.

C. Maintenance data for materials and products, for inclusion in Section 01 78 23 – Operation and Maintenance Data and Section 26 05 00 – Electrical, General. Include service bulletin(s).

1. Submit maintenance data and parts list for each roadway and parking area lighting fixture and accessory; including "trouble-shooting" maintenance guide. Include that data, product data, service bulletin(s), and illustrated parts list in a maintenance manual; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of exterior lighting units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with exterior lighting installation work similar to that required for this Project.

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PART 2 - PRODUCTS

2.1 FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs and sharp edges and corners.

B. Sheet Metal Components: Corrosion-resistant aluminum, except as indicated. Form and support to prevent warping and sagging.

C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.

D. Doors, Frames, and Other Internal Access Provisions: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.

E. Exposed Hardware Material: Stainless steel.

F. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

G. Plastic Parts: Resistant to yellowing and other changes due to aging and exposure to heat and UV radiation.

H. Lenses and Refractors: Materials as indicated. Use heat-and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.

I. Photoelectric Relay: UL 773.

1. Contact Relays: Single-throw, arranged to fail in the "on" position and factory set to turn light unit on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles with 15 seconds' minimum time delay.

2. Relay Mounting: In fixture housing.

2.2 HIGH-INTENSITY-DISCHARGE (HID) FIXTURES

A. Fixtures: Conform to UL 1572.

B. Ballasts: Conform to UL 1029 and ANSI C82.4. Provide constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.

1. Operating voltage matches system voltage.

2. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.

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3. Construct ballasts so open circuit operation will not reduce the average life.

4. Noise: Uniformly quiet operation, with a noise rating of B or better.

2.3 FIXTURE SUPPORT COMPONENTS

A. Mountings, Fastenings, and Appurtenances: Provide mountings that will correctly position the luminaire to provide the indicated light distribution.

2.4 LAMPS

A. Conform to ANSI Standards, C78 series, applicable to each type of lamp. Provide fixtures with indicated lamps. Where lamps are not indicated, provide lamps recommended by manufacturer.

2.5 FINISH

A. Metal Parts: Manufacturer's standard finish except as otherwise indicated. Finish applied over corrosion-resistant primer after fabrication, free of streaks, runs, holidays, stains, blisters, and similar defects. Remove poles, fixtures, and accessories showing evidence of corrosion or finish failure during Project warranty period and replace with new items.

B. Other Parts: Manufacturer's standard finish except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set units plumb, square, level, and secure according to manufacturer's written instructions and shop drawings.

B. Fixture Attachment: Fasten to indicated structural supports.

C. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.

D. Lamp fixtures with indicated lamps according to manufacturer's instructions. Replace malfunctioning lamps.

3.2 FIELD QUALITY CONTROL

A. Inspect installed units for damage.

B. Provide advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:

1. Check for excessively noisy ballasts.

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2. Check for uniformity of illuminations.

E. Replace or repair damaged and malfunctioning units and retest.

3.3 ADJUSTING AND CLEANING

A. Clean components on completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 26 56 00

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SECTION 31 00 00 - EARTHWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, and equipment as required for all excavation, grading, providing borrow materials, hauling, placing and compacting earthwork materials to construct the site to the grades shown on the plans.

B. Prior to commencement of any earthwork, the Contractor shall review the geotechnical reports. The Geotechnical Engineering Evaluation is provided as an appendix to the Plans and Specifications for information only and the Contractor is responsible for making any interpretations there from.

C. Submit to the Engineer's Field Representative load tickets on all materials delivered to the site.

1.2 REFERENCE STANDARDS

A. ASTM D 136 Sieve Analysis of Fine and Coarse Aggregates

B. ASTM D 422 Method for Particle - Size Analysis of Soils

C. ASTM D 698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregated Mixtures, Using 5.5-lb Rammer and 12-inch Drop

D. ASTM D 1556 Density of Soil by the Sand-Cone Method

E. ASTM D 1557 Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures, Using 10 lb. Rammer and 10 inch Drop

F. ASTM D 1633 Test Method for Compressive Strength of Molded Soil-Cement Cylinders

G. ASTM D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate

H. ASTM D 2487 Classification of Soils for Engineering Purposes

I. ASTM D 2901 Test Method for Cement Control of Freshly-Mixed Soil Cement

J. ASTM D 2922 Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

K. ASTM D 4254 Test Methods for Minimum Index Density of Soils and Calculative of Relative Density

L. OSHA - 1926.650-651 and other applicable sections.

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1.3 SUBMITTALS

A. The Contractor shall submit test results of all materials proposed to be used in work in accordance with the requirements of Section 01 33 00 - Submittal Procedures.

B. Submit sieve analysis, moisture density relationship test for both ASTM D698 and D1557, and sand equivalency. The sieve analysis and moisture density relationship tests must have been completed within 12 calendar months from the date of submittal.

1.4 DEFINITIONS

A. Backfill or Fill: (a) Material used to replace material removed during construction or (b) The act of replacing or placing material during construction.

B. Backfill Operation or Fill Operation: The method and the activity required to fill surface depressions and excavations, or to construct fills to required grades.

C. Common Fill: Fill or borrow materials which are naturally occurring and not meeting a specific gradation or classification.

D. Structural Fill: The act of placing common or imported fill material under controlled operation to a certain density.

PART 2 - PRODUCTS

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. The following types of suitable materials are defined (see Execution for the location where the materials are approved for use or where identified in other specifications and drawings):

1. Common Fill: Fill or borrow materials which are naturally occurring, not meeting a specific gradation or classification, are not Unsuitable Materials, and can be placed in a controlled operation to a certain density.

2. Crushed Stone Backfill (Bedding Chips): Pipe bedding to meet applicable requirements of 2020 Idaho Standards for Public Works Construction (ISPWC) Section 305. Manufactured angular, crushed stone, crushed rock, or crushed slag with the following gradation requirements:

Sieve Size	Percent Passing By Weight
1”	100
3/4"	80 - 100
3/8”	20 - 70
No. 4	5 - 20
No. 200	0 - 3

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3. Foundation Stabilization Backfill: Uncrushed gravel, and sand with the gradation requirements below. The material shall have a minimum sand equivalent value of 28, sand equivalent not required if less than 5% passing the No. 200 sieve.

Sieve Size	Percent Passing By Weight
3”	100
No. 4	25 - 60
No. 200	0 - 12

4. Crushed Aggregate Base:

   a. Must meet one of the following:

      i. ¾-inch “Type I” aggregate base material, specified in Table 1 from Section 802.2.2 – Crushed Aggregate for Base Gradation of 2020 version of Idaho Standards for Public Works Construction (ISPWC). The material shall meet the following gradation requirements:

Sieve Size	Percent Passing By Weight
1”	100
3/4"	90 - 100
No. 4	40 - 65
No. 8	30 - 50
No. 200	3 - 9

      ii. “3/4-inch B” nominal maximum size aggregate gradation requirement, specified in Table 703.04-1 from Section 703 – Aggregates of ITD SSHC.

   b. The sand equivalent value shall be not less than 30; sand equivalent not required if less than 5% passing the No. 200 sieve

   c. The material shall have a Los Angeles Abrasion of 35% or less.

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5. Topsoil: Excavated material that has a friable, loamy character and contains organic matter amount normal to the region. Obtain soil from well-drained arable land that does not contain subsoil, refuse, roots, heavy or stiff clay, stones larger than 1-inch, coarse sand, sticks, brush, litter, pesticides, contaminated soil, noxious weeds, or other material detrimental to vegetative growth and establishment. Test sources if noxious weeds are located within or adjacent to the source site and obtain approval from the Owner that the source is acceptable to use on the project site. Incorporate vegetative matter into topsoil, except brush, trees, or noxious weeds. Other deleterious material (e.g. plastic, glass, metal, rocks) will not exceed 0.1 percent by weight or volume. Remove and dispose of vegetation at topsoil sources before taking materials from the source. Topsoil material shall meet the following gradation and chemistry requirements:

Sieve Size	Percent Passing By Weight
1”	98 - 100
No. 4	95 - 100
No. 8	80 - 100
No. 200	15 - 80

Property	Minimum	Maximum
pH[1]	5.5	7.8
ESP[2]	--	10.0
EC[3]	--	8.0
Organic Material	0.5	15.0

[1] pH: Negative logarithm of the hydrogen ion concentration
[2] ESP: Exchangeable sodium percentage
[3] EC: Electrical conductivity, milliohms per cm at 77 °F

6. Gravel Surfacing: Meet the following requirements for gravel surfacing, including added binder or blending material:

Sieve Size	Percent Passing By Weight
3/4"	100
No. 4	40-80
No. 10	25-60
No. 200	8-20

a. Dust Ratio: the portion passing the No. 200 (0.075 mm) sieve cannot exceed two-thirds of the portion passing the No. 40 (0.425 mm) sieve.

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b. For material passing the No. 40 (0.425 mm) sieve, the liquid limit must not exceed 35 and the plasticity index must not be below 6 or above 12.

c. A wear factor not exceeding 40% at 500 revolutions.

d. At least 35% by weight of the aggregate retained on the No. 4 (4.75 mm) sieve must have one fractured face.

7. Backfill:

a. Allowable uses include wet well wall and structure backfill and utility trench backfill above bedding course for underground pipe.

b. Must be classified as GP, GM, GW, SP, SM, SW, ML, CL, or CH according to the USCS.

c. Must have a compacted wet density of at least 109 pcf.

d. Soil may not contain particles larger than 12 inches in median diameter.

e. Soil may not contain particles larger than 6 inches in median diameter within 2 vertical and horizontal feet of concrete footings, concrete walls, or pipes.

f. Soil must contain less than 3% organics and vegetation by weight (per ASTM D2974).

g. Soil must contain less than 3% wood, metal, plastic or other deleterious substances.

h. It is anticipated that the on-site silt undocumented fill and native clay within the planned construction depths at the Superior Street Lift Station site will meet the requirements listed above and be suitable for use as backfill provided it can be dried to within 3 percent of optimum moisture. Undocumented fill from the City Beach Lift Station site shall not be reused.

2.2 UNSUITABLE MATERIALS

A. Unsuitable material include the materials listed below:

1. Soils which, when classified under ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classification of Pt, OH, or OL.

2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.

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3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

4. Soils that contain greater concentrations of chloride or sulfate irons or have a soil resistively or pH less than the existing on-site soils.

5. Soils not maintaining moisture contents within 3 percent of optimum during compaction.

6. Soils containing more than 3 percent by weight of organics, vegetation, wood, metal, plastic, or other deleterious substances.

7. Undocumented fill encountered at the City Beach Lift Station site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Notify Engineer prior to starting any grading operations.

B. Identify required lines, levels, contours and datum.

C. Identify and flag surface and aerial utilities, known underground utilities locations.

D. Maintain and protect existing utilities which pass through the work area.

3.2 SITE CONTROL

A. Unfavorable Weather: Do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content of material is satisfactory.

B. Flooding: Provide berms or channels to prevent flooding or saturation of subgrade. Promptly remove all water collecting in depressions.

C. Softened Subgrade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and recompact as specified for fill.

D. Dust Control: Use all means necessary to control dust on and near the work and on and near all off-site borrow areas as specified in Section 01 50 00 – Temporary Facilities and Controls. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors, residents, properties, and concurrent performance of other work on the site.

E. Noise Control: Use equipment that is equipped with adequate noise attenuation devices.

3.3 OFF-SITE IMPACTS

A. Comply with all traffic and hauling requirements of the State and County.

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B. Provide all signing, flagmen, or other special traffic control required to provide for the safety of the public.

C. Use only vehicles approved for highway use and comply with all load requirements.

D. Provide wheel cleaning as required to minimize the tracking of materials onto public roadways.

3.4 PROTECTION

A. Protect trees and other features to remain as a portion of the final landscaping or project.

B. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Notify Engineer of unexpected subsurface conditions and discontinue affected work in the area until notified to resume work.

E. Protect bottom of excavations and soil adjacent to and beneath foundation from frost.

F. Grade excavation top perimeter to prevent surface water runoff into excavation.

3.5 EXCAVATION

A. Excavate all cut areas to the grades shown on the plans.

B. Excavate all areas that have excessive moisture content and cannot be compacted to the required densities.

C. Excavate all undocumented fill.

D. Correct unauthorized excavation at no cost to the Owner.

E. Excavate or scarify and aerate soils with excessive moisture content and allow to dry.

3.6 SUBGRADE PREPARATION

A. Excavate to subgrade elevation.

B. In the presence of a materials testing company, thoroughly proofroll with a loaded tandem-axle dump truck with a minimum weight of 20 tons, or 40-ton static roller.

C. Contractor shall maintain the subgrade in a compacted condition and protect subgrades from construction traffic disturbance once compaction requirements have been met.

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D. Areas where soft or disturbed conditions are identified, excavate, remove and dispose of unsuitable soft spot material. If the material is suitable except for excessive moisture content, scarify and dry the material to the acceptable moisture content, or replace with Engineer approved materials, and recompact to the density of the material to place over the area. Soft sport repair shall be incidental to the Work. No special payment will be made for soft spot repair.

E. The Contractor's materials testing company to submit a subgrade inspection report noting the means and methods used to proofroll the subgrade and any corrections or repairs made.

3.7 PREPARATION OF FOUNDATION

1. Per Geotechnical Engineering Evaluation.

3.8 CONSTRUCTION OF EMBANKMENTS

A. Fill areas to contours and elevations as shown on the plans. Do not use frozen materials.

B. Place and compact fill materials in continuous lifts not exceeding twelve (12) inches in depth, unless specifically allowed.

C. Employ a placement method so as not to disturb or damage utilities in trenches.

D. Maintain optimum moisture content of materials to attain required compaction density.

E. Make smooth changes in grade. Blend slopes into level areas.

3.9 IMPORTED STRUCTURAL FILL

A. Aggregate Subbase and Base, granular borrow, and common fill material under parking areas, drive lanes, and vehicle traffic areas, shall be compacted to at least 95% of the maximum dry density as determined in accordance with ASTM D698. Maximum loose lift thickness for aggregate base shall not exceed 12 inches. Maximum loose lift thickness for aggregate subbase, granular borrow, and common fill shall not exceed 10 inches.

B. Aggregate Subbase and Base material under buildings, including 4 feet outside the building area, and under equipment pads shall be compacted to at least 95% of the maximum dry density as determined in accordance with ASTM D1557. Maximum loose lift thickness for aggregate base shall not exceed 12 inches.

C. Granular material with more than 30% by weight retained on the 3/4-inch sieve shall be compacted to a minimum 75 percent of maximum index density as determined by ASTM D4253 and D4254. Drain rock and crushed stone backfill material does not require compaction.

3.10 DISPOSAL OF WASTE SOIL

A. Contractor shall dispose of waste material at an off-site location determined by the Contractor.

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3.11 QUALITY CONTROL

A. Material & Compaction Testing: All soils testing of samples submitted by the Contractor will be done by an independent testing laboratory mutually agreed upon by Contractor, Engineer, and Owner and at the Contractor's expense. If tests indicate work does not meet specific compaction requirements, remove work, replace, and retest at the Contractor's expense.

1. Qualifications of testing company

a. Basic requirements of ASTM E 329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials as Used in Construction" and ASTM D 3666, "Standard Specification for Minimum Requirements for Agency Testing and Inspecting Bituminous Paving Materials", as applicable.

b. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

2. Frequency of Compaction Tests

a. Curbs and sidewalks: In horizontal plane, test at start with subsequent tests a maximum of every 250 feet. At landscape islands test each island at one location. At every horizontal location, obtain one test at subgrade. Perform subsequent tests every 12 inches of compacted depth and at top of backfill or when materials or procedures change. Perform a minimum of two (2) tests at finished grade.

b. Parking and vehicle areas, roadways: In horizontal plane, test each backfill area with subsequent test for every 2,500 square feet of backfill surface area. At every horizontal location, obtain one test at subgrade. Perform subsequent tests every 12 inches of compacted depth and at top of backfill or when materials or procedures change.

c. Concrete slabs: In horizontal plane, test each backfill area with subsequent test for every 1,000 square feet of backfill surface area. At every horizontal location, obtain one test at subgrade. Perform subsequent tests every 12 inches of compacted depth and at top of backfill or when materials or procedures change.

d. Linear foundations and footings: In horizontal plane, test at start with subsequent tests a maximum of every 100 feet, and where elevation changes between adjacent footings. At every horizontal location, obtain one test at subgrade. Perform subsequent tests every 12 inches of compacted depth and at top of backfill or when materials or procedures change. Perform a minimum of two (2) tests at finished grade.

3.12 TOLERANCES

A. Finished grade of graded areas shall meet the following requirements:

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1. In paved areas including roadways, sidewalks, parking lots, etc., plus or minus 0.10 feet from the grade shown on the plans.

2. Structural pads, plus or minus 0.05 feet from the grade shown on the plans.

3. In landscaped areas or similar areas, plus or minus two (2) inches.

4. Differential grades between walking surfaces shall not exceed 1/4-inch.

5. Landscape finish grade adjacent to concrete walks shall be minus 1-inch from walking surface elevation.

END OF SECTION 31 00 00

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SECTION 31 05 19.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install geotextiles as specified herein and as indicated on the drawings and the Geotechnical Engineering Evaluation.

1.2 SUBMITTALS

A. Certificates: Submit geotextile manufacturer's certified test results showing that the geotextiles meet the requirements of these specifications.

B. Submit manufacturer's installation instructions and maintain copy at the jobsite.

PART 2 - PRODUCTS

2.1 GENERAL

A. Geotextiles shall be composed only of long chain polymeric (at least 85% polyolephins, polyesters or polyamides) filaments or yarns oriented into a stable network that retains its relative structure (including selvages) during handling, placement, and design service life.

2.2 SUBGRADE SEPARATION GEOTEXTILE

A. Verify geotextile delivered to the site meets the requirements of this specification.

B. Subgrade Separation Geotextile fabric shall be non-woven, with the following minimum properties:

Geotextile Property (Roll Values)	Test Method	Requirement
*Grab Tensile Strength – lb (in either principal direction)	ASTM D 4632	270 / 180
*Grab Elongation (%)	ASTM D 4632	<50% / ≥50%
*Puncture Strength – lb	ASTM D 6241	600 / 450
*Trapezoidal Tear Strength – lb	ASTM D 4533	100 / 75
Apparent Opening Size (AOS) (Standard Sieve)	ASTM D 4751 COE CW-002215	#30 or finer
Permittivity (sec-1)	ASTM D 4491	0.02
*For geotextiles with elongation which is less than 50%, the first strength value is applied. For geotextiles with elongation which is equal to or greater than 50%, the second strength value is applied.		

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PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect geotextiles against damage and excessive sunlight during shipment and storage.

3.2 EXAMINATIONS

Verify that surfaces upon which the geotextile is to be installed are graded to a smooth, uniform condition free of obstructions, depressions, and debris.

3.3 GENERAL PLACEMENT REQUIREMENTS

A. Spread geotextile immediately ahead of the covering operation. Do not drag the geotextile on the ground or mishandle in any way. Place the geotextile loosely and without wrinkles so that placement of the overlying material will not tear the geotextile.

B. Place the cover material on the geotextile in such a manner that a minimum of 12 inches of material will be between the equipment tires or tracks and the geotextile at all times.

C. Cover the geotextile with the specified cover material as soon as possible. Geotextiles which have not been ultraviolet stabilized shall not remain uncovered for longer than 7 days. Ultraviolet stabilized materials shall not remain exposed longer than 30 days.

3.4 PLACEMENT IN SOFT GROUND

A. Where geotextiles will be placed over soft ground, construction vehicles shall not drive directly on the geotextile material. End-dumping the cover material directly on the geotextile will not be permitted. Under no circumstances shall cover material be dropped on unprotected geotextile from a height greater than 3 ft. above the surface of the geotextile.

B. Limit compaction of the first lift above the geotextile over soft ground to operation of placing and spreading equipment only. No sheep foot type equipment will be allowed on the first lift. Subsequent lifts will be closely observed during compaction. If any foundation failures occur during compaction operations, lightweight compaction equipment shall be used. Use pegs, pins, or the manufacturer’s recommended methods as needed to hold the geotextile in place until the specified cover material is placed. Seams that have separated will require the removal of fill and the required overlap reestablished. Repair at no cost to the Owner.

3.5 REPAIRS

A. Should the geotextile be torn, punctured or the overlaps joints disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or pad or roadbed distortion, remove the backfill around the damaged or displaced area and repair or replace the damaged geotextile at no cost to the Owner.

B. The repair shall consist of a patch of the same type of geotextile placed over the ruptured area. The patch shall overlap the existing geotextiles a minimum of 2 feet from the edge of the rupture.

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3.6 JOINT OVERLAP

A. Subgrade Separation: Overlap the geotextile a minimum of 18 inches at all joints.

END OF SECTION 31 05 19.13

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide, install, and remove material and equipment necessary for removing water during excavation, backfill, and compaction for earthwork, structures, and piping. Dewater all utility trenches and structural excavations such that Work is performed in dry conditions. Maintain removal of water until backfilling is complete. Dewatering of trenches and other excavations is considered incidental to the construction of the Work including but not limited to permitting, reporting, plans, engineering calculations, and all work, materials related to dewatering efforts.

B. Maintain groundwater levels at a minimum of 2 feet below the proposed construction excavations. See Geotechnical Engineering Evaluation; groundwater may be encountered near the ground surface.

1.2 SUBMITTALS

A. Submit for approval a site-specific dewatering plan, sealed by a professional engineer, based on the location and configuration of site improvements. Evaluate the site conditions, potential dewatering options, and considerations relative to the dewatering design and equipment, and construction approach. Include the following minimum components in the plan:

1. Detailed shop drawings showing the locations of all excavations, shoring, and temporary dewatering equipment.

2. Detailed shop drawings showing the installation of temporary dewatering equipment.

3. Pumping and piping capacity.

4. Location of discharge and permit to discharge to any offsite facilities or irrigation system.

5. Sediment control devices.

6. Redundant pumps.

7. Power source and routing.

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1.3 PERMITTING

A. The dewatering plan shall be in accordance with all industry standard best management practices and Idaho DEQ requirements and shall be developed using sound engineering techniques. After Engineer approval, the Contractor shall submit the approved dewatering plan to DEQ with the Short Term Activity Exemption permit and dewatering plan of the dewatering system proposed. Submit approved Short Term Activity Exemption permit to the Engineer prior to implementation of the dewater plan.

B. Include dewatering in the stormwater pollution prevention plan for the Construction General Permit (CGP).

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor is responsible for all necessary equipment to implement and maintain the dewatering operations throughout the construction process. This includes but is not limited to:

1. Providing temporary power as necessary

2. Pumping equipment

3. Competent workmen for the operation of the pumping equipment

4. Temporary piping

5. Sedimentation basins

6. Standby/redundant equipment

B. Dewatered groundwater to be discharged to the following locations:

1. City Beach Lift Station: swale to the southeast of the lift station site, between the RV site and City Beach parking.

2. Superior Street Lift Station: catch basin(s)_ on southside of Superior Street, between 1st Avenue and Highway 95.

END OF SECTION 31 23 19

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SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all excavation of trenches, bedding, and backfilling work for construction of piping.

B. Excavation of trenches shall include all material excavated or removed regardless of type, character, composition or condition of the material.

1.2 SUBMITTALS

A. The Contractor shall submit samples of all materials proposed to be used in work. Sample sizes shall be determined by the testing laboratory.

1.3 DEFINITIONS

A. Pipe Zone: That portion of the vertical trench cross-section lying between a plane below the bottom surface of the pipe and a plane 6 inches above the top of the pipe.

B. Trench Zone: The portion of the vertical trench cross-section lying between the Pipe Zone and a point 18 inches below the finished grade.

C. Final Backfill: The portion of the vertical trench cross-section within 18 inches of finished grade.

D. Pipe Bedding: Material placed below the pipe and in the Pipe Zone.

E. Springline: The center axis of the pipe.

F. Trench Backfill: Material placed from the top of the Pipe Zone to finished grade.

G. Trench Foundation Material: Material placed below the Pipe Bedding.

PART 2 - PRODUCTS

2.1 PIPE BEDDING MATERIAL

A. Pipe bedding shall consist of crushed stone backfill (bedding chips) material per Section 31 00 00 - Earthwork.

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2.2 TRENCH BACKFILL MATERIAL

A. Excavated trench material may be used as follows:

1. Excavated trench material must meet requirements of “Backfill”, specified in Section 31 00 00 - Earthwork. Undocumented fill at the City Beach Lift Station site shall not be reused as trench backfill.

2. Material with excessive or deficient moisture content will not be considered as unsuitable if the moisture content can be adjusted to a level that allows obtaining compaction.

3. Imported backfill material shall conform to backfill per Section 31 00 00 - Earthwork.

2.3 FOUNDATION STABILIZATION

A. Trench foundation material shall consist of foundation stabilization backfill material per Section 31 00 00 - Earthwork.

2.4 IDENTIFICATION TAPE AND LOCATING WIRE

A. Locating wire shall be No. 12 AWG insulated cooper locating wire with 1/64” PVC insulation.

B. Identification tape shall be 3-inches wide, 4 mil polyethylene vinyl. Tape text and color shall meet the following requirements

Pipe Contents	Text	Color
Potable Water	“CAUTION – WATER LINE BURIED BELOW”	Blue
Pressure Sewer	“CAUTION – SEWER LINE BURIED BELOW”	Green
Pressure Irrigation	“CAUTION – IRRIGATION LINE BURIED BELOW”	Purple
Gas	“CAUTION – GAS LINE BURIED BELOW”	Yellow
Telephone	“CAUTION – PIPE LINE BURIED BELOW”	Yellow
Electric	“CAUTION – ELECTRICAL LINE BURIED BELOW”	Red

PART 3 - EXECUTION

3.1 EXISTING UTILITIES:

A. The Contractor shall be fully responsible for any and all damage to existing or constructed utilities and shall repair damages in accordance with utility owner’s requirements at no additional cost to the Owner. It shall be the Contractor’s responsibility to coordinate and notify all affected utility owners. Call 811 Dig-Line before commencing construction.

1. Parallel Utility Support: Work associated with parallel utility support and utility crossings shall be incidental to the work unless a specific bid item is provided for parallel utility support.

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2. Utility Crossing Support: All utilities that interfere with the construction of the trenching and pipe installation shall be temporarily supported in accordance with the utility owner's requirements. Work associated with utility crossings support shall be incidental to the work unless a specific bid item is provided for utility crossing support.

3. All crossing utilities shown on the plans and marked by Dig-Line shall be vertical and horizontally located, in a non-destructive manner, prior to construction to verify pipe elevation, materials, and diameter. This information shall be provided to the Engineer for evaluation of conflicts prior to construction. All potholes shall be backfilled immediately after obtaining information.

3.2 TRENCH EXCAVATION

A. Trenches shall be excavated to lines and grades shown on the drawings, with a minimum width at the top or crown of the pipe not to exceed the outside diameter of the pipe plus 2'. In the event the Contractor should over excavate in width or depth without the Engineer's approval, they shall provide pipe bedding for the full length of the over excavation. No special payment will be made for work caused by over excavation.

B. Trench shall be kept free from water at all times to facilitate fine grading, proper laying and joining of pipe, and prevention of damage to completed joints.

C. If the trench bottom is disturbed during excavation, compact trench bottom to 95% maximum density of the standard proctor, ASTM D698.

D. The Contractor shall conduct trench operations in such a manner as to provide adequate safety precautions for workmen, adjacent property, or the public at all times by use of adequate sheeting, shoring, or bracing to sustain stability of the trench floor and walls. The Contractor shall furnish, place, and maintain such shoring as may be required to support sides of the trench. Costs of shoring and bracing shall be considered incidental to trench excavation and backfill.

E. The Contractor shall conduct trench operations in such a manner as to provide adequate safety precautions for workmen, adjacent property, or the public at all times by use of adequate sheeting, shoring, or bracing to sustain stability of the trench floor and walls. The Contractor shall furnish, place, and maintain such shoring as may be required to support sides of the trench.

3.3 PIPE BEDDING

A. Place bedding in layers no thicker than 6 inches. Allow for bedding depth around pipe bells. Place bedding at least 4 inches below the pipe and 6 inches above the pipe.

B. Shovel slice and tamp to ensure that the bedding material is firmly placed.

C. Following placement of pipe, place additional bedding material up to the springline of the pipe. Shovel slice and tamp to ensure that the bedding material fills in and supports the pipe haunch area.

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D. In 6-inch lifts, place additional bedding layers from the pipe springline to 6 inches above the pipe.

3.4 TRENCH BACKFILL

A. Provide backfill material as specified in 31 00 00 – Earthwork.

B. All backfill material shall be placed in layers not to exceed 8-inch maximum loose lift thickness for native material and 12-inch maximum loose lift thickness for imported aggregate backfill.

C. The entire trench shall be compacted to 95% maximum density of the standard proctor as determined by ASTM D-698. Backfill must have a compacted wet density of at least 109 pcf.

D. Trenches under buildings and structures shall be compacted, the entire depth, to 95% maximum density of the modified proctor determined by ASTM D1557.

3.5 IDENTIFICATION TAPE AND LOCATING WIRE PLACEMENT

A. Unless indicated otherwise, attach locating wire to the crown of all buried pipelines using electrical tape, except gravity irrigation, sanitary sewer, or storm sewer mains having visible manholes or clean-out structures at all angle points. Provide 12” of slack wire above ground at each location of valve or wire box.

B. Unless indicated otherwise, identification tape shall be placed above all buried pipelines, 18” - 24” above the crown of the pipe, except gravity irrigation, sanitary sewer, or storm sewer mains having visible manholes or clean-out structures at all angle points.

C. Unless indicated otherwise, identification tape shall be placed above all buried pipelines that are installed with locating wire. Identification tape shall be placed 18” - 24” above the crown of the pipe.

3.6 QUALITY CONTROL

A. Material & Compaction Testing: All soils testing of samples submitted by the Contractor will be done by a testing laboratory mutually agreed upon by Contractor and Owner and at the Contractor’s expense. If tests indicate work does not meet specific compaction requirements, remove work, replace, and retest at the Contractor’s expense.

1. Qualifications of testing company

a. Basic requirements of ASTM E 329, “Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials as Used in Construction” and ASTM D 3666, “Standard Specification for Minimum Requirements for Agency Testing and Inspecting Bituminous Paving Materials”, as applicable.

b. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

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2. Frequency of Compaction Tests

a. Test section shall be a test at 2-feet above top of pipe and every 1-foot lift thereafter and at the top of the trench backfill.

b. Two (2) test sections, at different locations for every trench less than 300 feet in length, but not less than once per day.

c. One (1) test section per every 300 feet of additional trench and at locations where materials or construction procedures change, but not less than once per day.

3.7 CLEANUP

A. Surplus excavated material or stripped material not salvaged as topsoil and excavated material not meeting the requirements for backfill shall become waste. All waste material shall be disposed of by the Contractor.

END OF SECTION 31 23 33

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SECTION 31 40 00 – SHORING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Contract apply to this Section.

2. Review these documents for coordination with additional requirements and information that apply to Work under this Section.

B. Section Includes:

1. Design of bracing and shoring.

2. Selection of construction sequence.

3. Temporary bracing and/or shoring of the structure or portions of the structure as required to prevent the structure from becoming unsafe during construction.

4. Temporary shoring of excavations.

5. Construction and removal of posts, timbers, lagging, braces, etc. at the end of construction.

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.

3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

1.3 DESIGN REQUIREMENTS

A. General: The stability and integrity of the structure during construction shall be maintained at levels generally acceptable within the construction industry by the use of bracing and shoring. In no case shall the structure be allowed to become unsafe during construction. Design stresses in bracing and shoring shall not exceed the allowable stresses permitted in IBC.

B. Bracing and Shoring for Structures:

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1. The bracing and shoring systems required to provide temporary support of a structure or portions of a structure during construction shall be designed to support the dead, live, soil, earthquake and wind loads that may be imposed on the structure during construction in accordance with industry standards and generally accepted engineering principles.

2. The proposed bracing and shoring systems shall have foundations designed for allowable soil bearing pressures in accordance with the geotechnical investigation prepared for the Project.

C. Shoring of Excavations: The proposed shoring systems shall be designed for earth pressures and allowable soil bearing values as applicable in accordance with the geotechnical investigation prepared for the Project.

1.4 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Shop Drawings indicating layout, member sizes, connection details, and construction sequence for bracing and shoring. No work related to bracing and shoring shall take place until shop drawings are reviewed.

C. Design calculations of bracing and shoring showing member stresses and connections due to imposed loads.

1.5 QUALITY ASSURANCE

A. Design calculations and Shop Drawings of proposed bracing and shoring of the structure shall be prepared, stamped, and signed by a structural engineer registered in the State of Idaho.

1.6 PROJECT CONDITIONS

A. Refer to the Project Constraints for the Project construction requirements relating to schedules, sequencing and system protection.

PART 2 - PRODUCTS

2.1 MATERIALS FOR SHORING AND BRACING

A. Materials for shoring and bracing shall be undamaged, high-quality materials. Reuse of materials is allowable, but the material shall be in undamaged condition.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Construction of bracing and shoring shall be in accordance with the reviewed Shop Drawings prepared by the Contractor's Engineer.

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B. The Contractor shall hire the Engineer responsible for the design of bracing, shoring, and inspection of the Work as detailed on the bracing and shoring Shop Drawings, prior to saw cutting or removing portions of the structure.

C. The Engineer responsible for design of bracing and shoring shall inform the Owner's Project Engineer in writing that construction of bracing and shoring was completed in accordance with the Shop Drawings and meets its approval, prior to placement of concrete, saw cutting, and removal or modification of portions of the structure.

D. Remove surplus excavated materials from site.

3.2 REMOVAL OF BRACING AND SHORING

A. Bracing and shoring shall not be removed until the new Work has acquired sufficient strength to support their weight and the loads superimposed thereon safely. In no case may bracing or shoring be removed until the time and sequence has been approved by the Engineer responsible for bracing and shoring.

B. In general, bracing and shoring of concrete shall remain in place for at least ten days, when they may be removed provided the concrete is sufficiently hard and will not be injured.

END OF SECTION 31 40 00

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SECTION 32 12 16 – ASPHALT PAVING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, equipment and materials as required to provide new pavement, and to repair existing asphalt surfaced, streets, roads, driveways, or other similar improved areas damaged or removed by excavations.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Superpave Hot Mix Asphalt: Submit job mix formula per ISPWC standards. Prepare a submittal that includes:

1. The original approved mix design that includes the confirmed JMF from the previous project;

2. Adjustments made to the JMF that make it the C-JMF;

3. Adjustments made to the C-JMF during production;

4. Documentation supporting these adjustments.

5. Current Stockpile Quality Control testing that includes the following to confirm the material in stockpile is similar to the material used for the original mix design, including RAP:

   a. Sieve analysis on the stockpiles to be used, including crusher control charts;

6. Note: Previously used mix designs that are used during the calendar year of confirmation may omit Step 5 if the stockpiles consist of the crushed material, including RAP, from the original mix design. Previously used mix designs that more than one calendar year has elapsed from the time of confirmation must include Step 5.

7. JMF with a content of more than 30% recycle asphalt pavement (rap) will not be accepted, regardless of prior ITD approval.

C. Material Test Reports: For each paving material.

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1.3 QUALITY CONTROL

A. Testing Agency Qualifications: Qualified according to ASTM D3666 for testing indicated.

B. Pre-Paving Conference: Conduct conference at Project Site. Immediately before paving, the Contractor, the asphalt supplier, the Engineer, and the Owner personnel involved in the paving operation will hold a pre-paving conference to discuss the means that will achieve the highest quality surface.

1. Before the pre-paving conference, submit a Superpave HMA paving plan to the Engineer. Tailor the plan to the asphalt to be supplied, the anticipated JMF, and the Contractor's equipment and operation. Include at least the following:

a. Breakdown, intermediate, and finish rollers to be used

b. Static or vibratory rolling for breakdown and intermediate rolling

c. Frequency, amplitude, force/impact, and roller velocity for vibratory rolling

d. Proximity of breakdown roller to paver with respect to horizontal displacement

e. Proximity of intermediate roller to breakdown roller

f. Compaction temperatures for breakdown, intermediate, and finish rolling

g. Adjustments to paving/compaction operation with respect to temperature, amplitude, frequency, lift thickness, gradation, force/impact, and roller velocity

h. Rubber tired rolling with respect to pickup of pavement material

i. Paving equipment and preheating and vibratory settings of the screed

j. Coordination of plant production and paving operations; climate, haul distance

k. Surface and air temperatures anticipated during production

l. Temperature necessary to allow public traffic onto the new pavement surface

m. Anticipated traffic control issues as necessary

n. Additional equipment required

o. Inspection, sampling and testing requirements

p. Other paving issues as necessary

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PART 2 - PRODUCTS

2.1 PLANT MIX PAVEMENT

1. General: Asphalt to be SP-3 58-28 (1/2” aggregate) Superpave hot mix asphalt shall conform to the 2020 Idaho Standards for Public Works Construction (ISPWC) standards.

2.2 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, or crushed gravel.

C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

1. For plant mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.3 AUXILIARY MATERIALS

A. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not place pavement on a wet or frozen surface or when weather or surface conditions will otherwise prevent the proper handling or finishing of the pavement placement.

B. Air and Surface Temperature Limitations:

Compacted Thickness of Individual Courses	Top Course	Leveling and Courses Below the Top Course
Less than 1.5”	60°F	-
1.5” to 3”	50°F	40°F
Greater than 3”	40°F	40°F

C. Asphalt concrete shall not be placed when the surface and atmospheric temperature is below 40 degrees F, if rain is imminent or expected before time required for adequate cure, or if subgrade is wet or excessively damp.

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3.2 SURFACE PREPARATION

A. Aggregate base shall be provided where indicated to the thickness indicated. The compacted surface of the finished aggregate shall be hard, uniform, smooth and at any point shall not vary more than 0.02 feet from the indicated grade or cross-section.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed at no cost to the Owner.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Verify that subgrade is dry and in suitable condition to begin paving.

E. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, plant mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying plant mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 PATCHING

A. Plant Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches minimum into adjacent sound pavement. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Patching: Fill excavated pavements with plant mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.4 SUPERPAVE HOT MIX ASPHALT PAVING

A. Machine place Hot Mix Asphalt on prepared surface, spread uniformly, and strike off. Place Hot Mix Asphalt by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place Hot Mix Asphalt base course in number of lifts and thicknesses indicated.

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2. Place Hot Mix Asphalt surface course in single lift.

3. Spread mix at minimum temperature of 250 deg F (121 deg C).

4. Begin applying Hot Mix Asphalt along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place Hot Mix Asphalt in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with plant mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of Hot Mix Asphalt courses.

1. Clean contact surfaces and apply tack coat to joints.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method.

5. Compact joints as soon as Hot Mix Asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

A. General: Begin compaction as soon as placed plant mix paving will bear roller weight without excessive displacement. Compact plant mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Do not operate vibratory rollers in the vibratory mode when the internal mix temperature is less than 175 °F or when checking or cracking of the mat occurs at a higher temperature.

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B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while plant mix asphalt is still hot enough to achieve specified density. Continue rolling until plant mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while plant mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, plant mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Surface Course: 1/8 inch.

2. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

C. Corrective Actions:

1. Grind the asphalt pavement to within the surface smoothness tolerance, if thickness permits in accordance with the above criteria.

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2. All grinding shall be done parallel to centerline. Adjacent grinder passes within any single ground area shall be extended to produce a neat rectangular area having a uniform surface appearance. At transverse boundaries between ground and unground areas, smoothly feathered transitions shall be made.

3. The Contractor shall check the pavement for smoothness after grinding, in accordance with these specifications and shall make any additional corrections necessary to the pavement to achieve smoothness.

4. After grinding has been completed, the ground pavement surface shall receive a fog coat at a rate approved by the Engineer.

5. The cost of such grinding or milling, and all related work such as fog coat, disposal of milled material, traffic control, flagging, profiling, surface repair of ground or milled areas, and temporary pavement markings shall be at the Contactor's expense.

6. If correction of the pavement as listed above will not produce satisfactory results as to smoothness, or will reduce pavement thicknesses and serviceability excessively, the pavement shall be removed and replaced or overlaid to correct the deficiency at no additional cost to the project.

3.8 FIELD QUALITY CONTROL & ACCEPTANCE

A. Thickness: The Contractor shall extract core samples from the in-place compacted plant mix pavement. Thickness will be determined according to ASTM D 3549.

1. Take two samples minimum. Take one core samples for every 3,500 square feet, at least one sample every day.

2. Tolerance: Plus 1/4 inch (6 mm), no minus.

3. If more than 25% of pavement core samples fail to meet thickness requirements with a tolerance of 0-1/4" minus of the project requirements, or if more than 10% fail to meet thickness requirements with a thickness deficit greater than 1/4", corrective actions shall be taken at no additional cost to the Owner.

4. Corrective Actions:

a. Install 1.5-inch asphalt overlay with same Job Mix Formula and Plant Mix Pavement, if grades allow, or

b. Remove and replace pavement to specified thickness, grades, and smoothness.

c. If allowed by the Engineer, adjusts price for asphalt pavement that does not meet thickness requirements in accordance with the following pay factor (PF) reductions:

1) If thickness is ≥ 100% of Required Thickness, PF = 1.0.

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2) If thickness is 1/4" less than the Require Thickness, PF = 0.80.

3) If thickness is 1/2" less than the Require Thickness, subject to rejection, if allowed to remain in place, the PF will be 0.75.

5. Core Samples during Pavement Placement: If cores are taken during placement of pavement, fill core sample holes with hot mix asphalt.

6. Core Samples after Pavement Placement: If cores are taken after placement of pavement, fill core sample hole with 4,000 psi concrete. Prevent concrete from staining asphalt pavement by using a plastic sheet around the core hole while filling with concrete. Tap plastic sheet down.

B. The relative density after compaction shall be 92-96 percent of the density obtained by using ASTM D 1188 or D 2726. A properly calibrated nuclear asphalt testing device shall be used for determining the field density of compacted asphalt concrete, or slabs or cores may be laboratory tested in accordance with ASTM D 1188.

3.9 CLEAN-UP

A. After Work of this Section is complete, remove all debris, rocks, gravel, excess asphalt.

END OF SECTION 32 12 16

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide chain link fencing and swing gates and appurtenant Work, complete and operable.

1.2 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop drawings of fences and gates with all dimensions, details, and finishes. Drawings must include post foundations.

C. Product data: Manufacturer’s catalog indicating materials and a letter certifying that all conditions of the specifications have been met.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Chain link fencing and gates shall be products of a single manufacturer which has been successfully engaged in the production of such items for a period of at least 5 years.

B. Installer's Qualifications: Installation of the chain link fence shall be by the manufacturer or by a firm accepted and licensed by the manufacturer.

PART 2 - MATERIALS

2.1 GENERAL

A. All perimeter fencing and gates shall be 6 feet high. All materials and components shall be new, first quality items specifically manufactured for the intended application.

2.2 CHAIN LINK FENCE FABRIC

A. Chain link fence fabric shall be made of steel wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or twisting the ends of the wire to form the desired selvage of the fabric.

B. Fence fabric shall be No. 11 gauge steel wire, 2-inch mesh, with top selvages knuckled and bottom selvages twisted and barbed. Fabric shall be galvanized in conformance with ASTM A392, Class 1, with not less than 1.2 ounces zinc per square foot of coated surface.

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2.3 STEEL FENCE FRAME MEMBERS

A. Steel pipe produced in accordance with commercial standards. Minimum yield strength of 50,000 psi. Cold formed and welded per ASTM F1043 Group IC. Pipe sections to conform to ASTM A120, Schedule 40 standard weights.

B. Pipe Section Size

1. End and Corner Post 2-3/8” OD, 3.65 lb/ft

2. Line 1.9” OD, 2.72 lb/ft

3. Rail and Braces 1.66” OD, 2.27 lb/ft.

4. Gate Post 6-5/8” OD

2.4 FITTINGS

A. Chain link fence fittings per ASTM F 626. All ferrous metal fittings to be galvanized.

B. Post caps: Steel, cast iron or aluminum alloy; must be weatherproof to prevent moisture intrusion into post. Top with arm to be provided when barbed wire is specified or intermediate or line post tops to have loop for top rail when only rail is specified.

C. Rail ends: Formed steel or iron, designed to provide secure connection of top rails to terminal post and brace or other rails to terminal and intermediate posts.

D. Sleeves: Lengths of top rails to be connected using 6" sleeves with a .055 minimum wall thickness that allow for expansion or contraction of the rail.

E. Tie Wire: 9 gauge galvanized steel or aluminum for attachment of chain link fabric to rails. Hog rings attach fabric to tension wire to be 12-1/2 GA steel.

F. Fabric bands and brace bands to be pressed steel.

G. Tension (stretcher) bars to be made of one continuous piece of steel or aluminum, 3/16" x 3/4", in the same height as the fence. Provide one bar, per end or gate post and two bars per corner or pull post.

H. Tension wire: Galvanized steel wire, 7 gauge core, having a tensile strength of 75,000 psi.

I. Truss rods & tightened. Rod diameter 3/8".

J. Nuts, bolts and screws shall be steel, minimum size 3/8-inch diameter, hot-dip galvanized after fabrication.

K. Galvanized coating damaged during construction of the fencing shall be repaired by application of Galvo-Weld; Galvinox; or equal.

L. Privacy slats shall be 2-inch-wide plastic vertical tubing (PTV) top-lock slats, height to match fence fabric height. Color to be green or as specified by Owner. Provide standard manufacture color palette with product submittal.

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2.5 SWING GATE

A. Chain link swing gate and fittings per ASTM F626. All ferrous metal fittings to be galvanized.

B. Chain link swing gates as per ASTM F 900 Specifications for Industrial and Commercial Swing Gates.

C. Gate to be equipped with fork latch with pad-lock hole to be pressed steel.

D. Plunger to be hot-dipped galvanized drop rod, 1/2-inch diameter, 30-inches long, with a 4-inch-long handle.

2.6 POST FOUNDATIONS

A. Concrete Class 3000 in accordance with ISPWC Section 703.2.4 Table 1.

PART 3 - EXECUTION

3.1 GENERAL

A. Inspection: Prior to commencing installation, require Installer to inspect all areas and conditions within which Work of this Section will be performed. Dimensions and clearances shall be verified. Final grading shall be completed and all earth, brush, or other obstructions which interfere with the proper alignment and construction of fencing shall be removed.

B. Unless otherwise indicated, all posts shall be set in concrete. Gate and related posts, corner posts, and other critical elements shall be provided with concrete foundations which are designed by an engineer to safely accommodate the loads to which they will be subjected.

3.2 INSTALLATION

A. Excavation: Holes for posts shall be drilled or hand excavated to the diameters and spacing indicated on the plans, in firm, undisturbed or compacted soil. Post foundations shall comply with the following:

B. Holes shall be excavated to a diameter not less than 12-inches or not less than 5 times the largest dimension of the item being anchored, whichever is larger.

C. Depth for holes shall be not less than 40 inches.

D. Setting Posts: Line posts shall be spaced at not more than 10-foot intervals, measured from center to center of the posts, parallel to the ground slope. Posts shall be set plumb and shall be centered in holes, 4-inches above the bottom of the excavation, with posts extending not less than 36-inches below finish grade surface.

E. Corner posts shall be installed where changes in the fence lines equal or exceed 30 degrees, measured horizontally.

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F. Each post shall be properly aligned vertically and its top aligned parallel to the ground slope. Posts shall be maintained in proper position during placement and finishing operations.

G. Concrete: Concrete for footings may be placed without forms, providing the ground is firm enough to permit excavation to neat line dimensions. Prior to placing concrete, the earth around the hole shall be thoroughly moistened.

H. Encasement concrete for footings shall be placed immediately after mixing in a manner such that there will be no concentration of the large aggregates. The concrete shall be consolidated by tamping or vibrating.

I. Concrete footings shall have a neat appearance and shall be extended 2-inches above grade and troweled to a crown to shed water.

J. A minimum of 7 days shall elapse after placing the concrete footings before the fence fabric is fastened to the posts.

K. Bracing: Bracing shall be provided at all ends, corners, gates, and intermediate brace posts. Corner posts and intermediate brace posts shall be braced in both directions. Horizontal brace rails shall be set midway between the top rail and the ground, running from the corner, end, intermediate brace or gate post to the first line post. Diagonal tension members shall connect tautly between posts below horizontal braces.

L. Braces shall be so installed that posts remain plumb when diagonal rod is under proper tension.

M. Intermediate Brace Posts: Where straight runs of fencing exceed 500-feet, intermediate brace posts shall be installed, spaced equally between ends or corners; with additional posts provided as required, such that the spacing between intermediate brace posts does not exceed 500-feet. Intermediate brace posts shall be equivalent in size to corner posts and shall be braced with horizontal brace rails and diagonal tension members in both directions.

N. Top Rails: Top rails shall be run continuously through post caps, bending to radius for curved runs. Expansion couplings shall be provided as recommended by the fencing manufacturer.

O. Tension Wire: Continuous bottom tension wire shall be stretched tight with turnbuckles at end, gate, intermediate, and corner posts. Tension wire shall be installed on a straight grade between posts, with approximately 2-inches of space between finish grade and bottom selvage, unless otherwise indicated. Tension wire shall be tied to each post with not less than 6 gauge galvanized wire.

P. Fabric: The chain-link fabric shall be fastened on the secured side of the posts. Fabric shall be stretched and securely fastened to posts. Between posts, top and bottom edges of the fabric shall be fastened to the top rail and bottom tension wire, respectively. Fabric shall be stretched and anchored in such a manner that it remains in tension after the pulling force is released.

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Q. Tie Wires: Tie wire shall be bent to conform to the diameter of the pipe to which it is attached, clasping pipe and fabric firmly with ends twisted at least two full turns. Ends of wire shall be bent back to minimize hazard to persons or clothing.

R. Fabric shall be tied to line posts with tie wires spaced at 12-inches on center.

S. Fabric shall be tied to rails and braces with tie wires spaced at 14-inches on center.

T. Fabric shall be tied to tension wires, with hog rings spaced 18-inches on center.

U. Stretcher Bars: Fabric shall be fastened to end, corner, intermediate brace, and gate posts with stretcher bars. Bars shall be threaded through or clamped to fabric at 4-inches on center and secured to posts with stretcher bar bands spaced no more than 14-inches on center.

V. Fasteners: Nuts for tension bands and hardware bolts shall be installed on the side of fence opposite the fabric side. Ends of bolts shall be peened or the threads scored to prevent removal of nuts.

3.3 GROUNDING

A. Fences crossed by power lines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150-feet on each side of the crossing.

B. Fences, gates and appurtenances enclosing electrical equipment areas, gas yards, or other hazardous areas shall be electrically continuous and grounded.

C. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4-inch by 10-foot long copper-'clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6-inches below grade.

1. Where driving is impracticable, electrodes shall be buried a minimum of 12-inches deep and radically from the fence. Top of electrode shall be not less than 2-feet or more than 8-feet from the fence.

D. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps so as to create electrical continuity between fence posts, fence fabric, and ground rods. After installation, the total resistance of fence to ground shall not be greater than 25 ohms.

END OF SECTION 32 31 13

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SECTION 32 31 14 – WELDED STEEL FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide ornamental welded steel fencing and swing gates and appurtenant Work, complete and operable.

B. The system shall include all components (i.e., panels, posts, gates, and hardware) required.

1.2 SUBMITTALS

A. Submit shop drawings of fences and gates with all dimensions, details, and finishes. Drawings must include post foundations.

B. The manufacturer's gate drawings shall identify the necessary gate hardware required for the application.

C. Product data: Manufacturer's catalog indicating materials and a letter certifying that all conditions of the specifications have been met.

1.3 STANDARDS

A.	ASTM A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
B.	ASTM B117	Practice for Operating Salt-Spray (Fog) Apparatus.
C.	ASTM D523	Test Method for Specular Gloss
D.	ASTM D714	Test Method for Evaluating Degree of Blistering in Paint.
E.	ASTM D822	Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
F.	ASTM D1654	Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
G.	ASTM D2244	Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
H.	ASTM D2794	Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
I.	ASTM D3359	Test Method for Measuring Adhesion by Tape Test.
J.	ASTM F2408	Ornamental Fences Employing Galvanized Steel Tubular Pickets.

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1.4 QUALITY ASSURANCE

A. Contractor to coordinate with Owner to review existing fence panels and gates to be re-used. Contractor to re-coat all existing panels to ensure a uniform fence.

B. Manufacturer's Qualifications: Fencing and gates shall be products of a single manufacturer which has been successfully engaged in the production of such items for a period of at least 5 years.

C. Installer's Qualifications: Installation of the fence shall be by the manufacturer or by a firm accepted and licensed by the manufacturer.

D. Warranty:

1. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering, or corroding.

2. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufacturer’s warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 - PRODUCTS

2.1 GENERAL

A. All perimeter fencing and gates shall be a minimum of 4 feet high. All materials and components shall be new, first quality items specifically manufactured for the intended application. Contractor to provide fence panels as required to complete fence as well as new posts.

B. The fence system shall conform to Montage Commercial standard picket space Welded and Rackable Ornamental Steel, Classic design, extended picket bottom rail treatment, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, or equal.

2.2 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft^2, Coating Designation G-60.

B. Material for pickets shall be 3/4” square x 14 Ga. tubing. The rails shall be steel channel, 1.5” x 1.4375” x 14 Ga.

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2.3 FABRICATION

A. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

B. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

C. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by a fusion welding process to complete the rigid panel assembly, producing a spatter-free appearance on both sides of the panel.

D. The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by a duplex application of an epoxy primer and an acrylic topcoat. The coating shall be black, and the minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

TABLE 1 – COATING PERFORMANCE REQUIREMENTS

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

E. Gates shall be fabricated using fusion welded ornamental panel material and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

2.4 HARDWARE

A. Fence and gate hardware, including brackets for attaching fence panels to posts, hinges, etc. shall be provided by the manufacturer.

B. Type and quantity of gate hinges shall be based on the application, weight, height, and number of gate cycles.

C. Gate shall be equipped with fork latch with padlock hole.

D. Gate shall be equipped with drop rod, 1/2-inch diameter, 30-inches long, with a 4-inch-long handle.

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2.5 POST FOUNDATIONS

A. Concrete Class 3000 in accordance with ISPWC Section 703.2.4 Table 1.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling.

B. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

3.2 PREPARATION

A. All new installation shall be laid out by the Contractor in accordance with the construction plans.

3.3 INSTALLATION

A. Excavation: Holes for posts shall be drilled or hand excavated to the diameters and spacing indicated on the plans, in firm, undisturbed or compacted soil. Post foundations shall comply with the following:

1. Holes shall be excavated to a diameter not less than 5 times the largest dimension of the item being anchored, or as shown on the drawings, whichever is larger.

2. Depth for holes shall be not less than 40 inches.

B. Setting Posts: Line posts shall be spaced at not more than 8-foot intervals, measured from center to center of the posts, parallel to the ground slope. Corner posts shall be installed where changes in the fence lines equal or exceed 30 degrees, measured horizontally.

C. Posts shall be set plumb and shall be centered in holes, 4 inches above the bottom of the excavation, with posts extending not less than 36 inches below finish grade surface.

D. Each post shall be properly aligned vertically and its top aligned parallel to the ground slope. Posts shall be maintained in proper position during placement and finishing operations.

E. Concrete: Concrete for footings may be placed without forms, providing the ground is firm enough to permit excavation to neat line dimensions. Prior to placing concrete, the earth around the hole shall be thoroughly moistened.

F. Encasement concrete for footings shall be placed immediately after mixing in a manner such that there will be no concentration of the large aggregates. The concrete shall be consolidated by tamping or vibrating.

G. Concrete footings shall have a neat appearance and shall be troweled to a crown to shed water.

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H. A minimum of 7 days shall elapse after placing the concrete footings before the fence is fastened to the posts.

I. Fence panels shall be attached to posts with brackets supplied by the manufacturer.

J. When cutting/drilling rails or posts, adhere to the following steps to seal the exposed steel surfaces:

1. Remove all metal shavings from cut area.

2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.

3. Apply 2 coats of custom finish paint matching fence color.

K. Follow manufacturer’s recommendations for products and procedures to seal, prime, and finish exposed surfaces.

3.4 GATE INSTALLATION

A. Gate posts shall be spaced according to the manufacturers’ gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.

B. Gate hardware shall be installed per manufacturer’s recommendations.

3.5 CLEANING

A. The Contractor shall clean the jobsite of excess materials.

END OF SECTION 32 31 14

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SECTION 33 05 62 - PRECAST CONCRETE MANHOLES AND VAULTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials and equipment as required to install precast manholes and vaults, including but not limited to, excavation, backfill, forms, concrete work, precast barrel sections and cone section, aluminum hatches, cast iron frame and cover, and all incidental work and appurtenances.

1.2 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures. At a minimum, the Contractor shall submit the following:

1. Show dimensions, locations, lifting inserts, reinforcements, and joints.

2. Manufacturer catalog sheets on vaults doors, access hatches, and manhole lids, frames and covers.

3. Structural design calculations for vaults and manholes stamped by a registered engineer.

4. Submit fabricator’s installation instructions.

1.3 QUALITY ASSURANCE

A. Inspection: Prior to installation, the Contractor shall inspect all vaults and manhole components. No cracked or damaged vault or manhole shall be installed. The Contractor shall notify the Engineer when the vault and manhole components are delivered. Refer to Section 01 45 33 – Special Inspection, Observation, and Testing for schedule of special inspections.

B. Testing: Perform final testing after backfilling and compaction and following installation of other utilities, but prior to surface restoration or paving. Testing shall be performed in the presence of the Engineer. Use one of the following testing methods:

1. Hydrostatic Testing

a. Pre-fill: Fill manhole or vault with water 24 hours prior to the time of the test.

b. Plug holes: Plug all piping, inlets and outlets in the manhole.

c. Requirement: An allowance of 0.1 gallon/hour for each 1 foot of manhole depth is allowed. If test fails, repair and retest.

d. Duration: Minimum time duration of test to be one continuous hour.

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2. Vacuum Testing (for 4-foot to 6-foot diameter manholes):

   a. Tester: NPC Manhole Vacuum Tester, or approved substitution.

   b. Procedure

      1) Plug holes: Plug all piping, inlets and outlets in the manhole.

      2) Brace pipe plugs to prevent them from being drawn into the manhole.

      3) Place Test Head: Inside of the top of the cone section and inflate seal in accordance with the manufacturer's recommendations.

      4) Draw a Vacuum to 10 inches of mercury and shut off the vacuum pump.

      5) Measurement: With the valves closed, measure the time for the vacuum to drop to 9 inches.

      6) Requirement: Time to be greater than those indicated in following:

Manhole Depth (ft)	Diameter (in)				
	48	54	60	66	72
	Time (sec)				
6	40	43	46	49	53
8	40	43	46	49	53
10	45	49	53	56	61
12	50	55	59	63	69
14	55	61	66	71	77
16	60	66	72	78	87
18	60	68	75	83	90
20	60	68	75	83	90
22	60	68	75	83	90
24	60	68	78	87	97
26	60	75	85	94	105
28	64	81	91	101	113
30	69	87	98	108	121

      7) Repair and retest if manhole fails the initial test.

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PART 2 - PRODUCTS

2.1 GENERAL

A. The minimum wall thickness for vaults and manholes shall be 5-inches. Cement shall be Type V Portland cement as specified in ASTM C 150. The minimum 28-day concrete compressive strength shall be 3,000 psi.

B. Design Loading: All vaults and manholes shall be designed for HS-20 traffic loading.

2.2 PRECAST MANHOLE BASES

A. Base Sections shall conform to ASTM C 478.

B. Provide a flexible connection between manhole and pipe. The connector shall be of a size specifically designed for the pipe material and size being utilized. Approved manufacturers are:

1. Power Sleeve Expansion (PSX) by the Press-Seal Gasket Corporation.

2. A-lok by A-lok Products, Inc.

3. Kor-N-Seal as manufactured by NPC, Inc.

4. Link seal as manufactured by PSI, Inc.

5. Approved Equal.

C. If a manhole is core drilled, use Kor-N-Seal boot or approved substitution. Kor-N-Seal allowed for gravity applications only.

D. Manhole joints shall be fabricated to form an interlocking joint.

E. Precast trough to a section identical with that of the lower half of the pipe flowing through the manhole. Trough to be smooth, with flow-through characteristics and in accordance with the plans. At transitions of different pipe diameters, form a smooth transition.

F. Shelf of trough to slope towards trough.

2.3 PRECAST MANHOLE RISER SECTIONS AND CONICAL TOP

A. Risers and conical tops shall conform to ASTM C 478.

B. Manhole joints shall be fabricated to form an interlocking joint.

2.4 PRECAST CONCRETE VAULTS

A. Culverts, Storm Drains and Sewer precast reinforced concrete box sections shall conform to AASHTO M 259 and ASTM C 858.

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2.5 APPROVED PRECAST MANUFACTURES

A. Wilbert Precast of Spokane, WA

B. White Block Precast of Spokane, WA

C. CDA Redi-Mix and Precast of Coeur d'Alene, ID

D. Others as approved by the Engineer.

2.6 FRAMES AND COVERS

A. Castings: Castings for frames and covers shall conform to the requirements of ASTM A 48, Class 30. Cast iron covers and frames shall be heavy traffic type. Frame and cover shall be designed for HS-20 traffic loading.

B. Sewer, Water, Storm Sewer, and irrigation covers shall be 24 inches in diameter, with embossed lettering saying SEWER, WATER, STORM SEWER, or IRRIGATION.

C. Power and Communication covers shall be 30 inches in diameter with the embossed lettering saying POWER or COMMUNICATION.

D. Lock-type Castings: Provide a locking device made of corrosion resistant metal such that the cover may be readily released from the frame, where indicated on plans.

E. Castings Manufacturers or equal include:

1. Alhambra Foundry Co., Ltd.

2. Neenah Foundry Co.

3. Vulcan Foundry, Inc.

2.7 ACCESSORIES

A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 6000 psi in 28 days.

B. Steps - Plastic Coated Steel. Material: 1/2-inch steel reinforced bar covered with a polypropylene plastic.

C. Grade Rings

1. Concrete grade rings.

2. WHIRLyGIG Collaring System.

D. Joint Materials

1. Exterior Wrap: EZ-WRAP or approved substitute.

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2. Mastic Gasket: Ram-Nek or approved substitute.

3. Joint Sealant: Vulkem 116 or approved substitute.

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Aggregate base to be leveled within 1/2 inch of true grade.

B. Grouting of troughs, sharp edges, or rough trough sections are not permitted.

C. Divert flow for at least 24 hours following construction of the trough section.

3.2 BARREL SECTIONS

A. Construct manhole base and sections so they are absolutely watertight both in the floor and for the full height of the walls. Wet well bases to be cast with first barrel section.

B. Prior to installation of barrel sections, clean all joining surfaces thoroughly and place mastic gasket and joint sealant to the top of the concrete base or section providing a watertight seal.

C. Place section plumb and true.

D. Trim Mastic Gasket flush with the inside wall of the manhole.

E. Seal exterior manhole surface at joint with Exterior Wrap.

F. Grouting of joints in not acceptable.

3.3 HEIGHT OF MANHOLE COVER

A. Where manholes are located in paved areas or unimproved traveled areas, place manhole covers flush with the ground surface. For manholes located in unimproved areas where there is no vehicular traffic, such as borrow pits, fences lines, easements, etc., attached the frame directly to the cone, with mastic gasket, place the cover 6” minimum above the ground surface to prevent water inflow into the manhole lid.

3.4 GRADE RINGS

A. Adjust frame elevation to finish grade with grade rings. Maximum distance from the top of the cone or lid shall be no more than 21”

B. Place mastic gasket between cone and grade ring, grade ring and grade ring, and grade ring and frame.

3.5 CONCRETE COLLARS

A. Cement shall be Type III Portland cement as specified in ASTM C150. The minimum 28-day concrete compressive strength shall be 3,000 psi.

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B. Rebar shall be grade 60 and placed as shown on plans.

C. Collar size and depth shall be as shown on the plans.

D. Finish the surface of the concrete collar with a smooth uniform lightly broomed surface 1/8 inch to 1/4 inch below the adjacent grade.

E. Install frame and lid even with the concrete surface.

F. In traffic areas, install 1” thick metal plat over concrete collar for 7-days.

3.6 CONNECTOR ASSEMBLY

A. Install pipe connectors per manufactures requirements.

END OF SECTION 33 05 62

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SECTION 40 05 00 – PIPING, GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide the piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. Where pipe supports and spacings are indicated on the drawings and referenced to a standard detail, the Contractor shall use that detail. Where pipe supports are not indicated on the drawings, it is the Contractor's responsibility to develop the details necessary to design and construct all mechanical piping systems to accommodate the specified equipment and to provide all spacers, adapters, and connectors for a complete and functional system.

C. Piping system drawings are diagrammatic and are intended to show approximate location of equipment and piping. Dimensions given on the plans take precedence over scaled dimensions. Verify dimensions, whether in figures or scaled, in the field. The Contractor shall be responsible for the installation of complete and workable systems, whether completely detailed in the plans or not.

D. The Contractor shall ascertain locations of apparatus, fixtures, equipment, and piping in the field and layout work accordingly. The Owner reserves the right to have minor changes in location of piping and equipment made up to the time of installation without additional cost.

1.2 REFERENCE STANDARDS

A. All mechanical work shall conform to latest edition of the International Mechanical Code.

B. Commercial Standards

1.	ASTM B 88	Hard Copper Tube
2.	ASME B 16.22	Copper Fittings
3.	ANSI/ASME B 1.20.1	Pipe Threads, General Purpose (inch)
4.	ANSI B 16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
5.	ANSI/AWWA C 207	Steel Pipe Flanges for Water Works Service; Sizes 4 in through 144 in.
6.	ANSI/AWWA C 606	Grooved and Shouldered Joints
7.	ANS/AWS D1.1	Structural Welding Code

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8.	ASTM A 307	Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile
9.	ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints
10.	ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement
11.	ASTM D 2000	Classification System for Rubber Products in Automotive Applications

1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittal Procedures.

B. At a minimum, the following information shall be submitted for review and approval prior to ordering piping materials:

1. Manufacturer specifications for each pipe type, including all references to acceptable standards as included in each individual pipe section.

2. Fittings and manufacturer recommended connections.

3. Pressure ratings.

4. Lining and coating type, thickness, and application procedures.

5. Fitting types and manufacturer recommended applications and acceptable installation procedures and tolerances.

6. NSF 61 certification for all products to be in contact with potable water.

C. Fabrication Drawings: The Contractor shall submit piping fabrication drawings showing all fittings, pipe material, supports, and all dimensions for proper installation of piping system as illustrated on mechanical drawings.

1.4 QUALITY CONTROL

A. Certifications: Necessary certificates, test reports, and affidavits of compliance shall be obtained by the Contractor. A certification from the pipe fabricator that each pipe will be manufactured subject to the fabricator's or a recognized quality control program. An outline of the program shall be submitted to the Engineer for review prior to the manufacture of any pipe.

B. Where the assistance of a manufacturer's service representative is advisable to obtain recommended pipe joints, supports, or special connections, the Contractor shall furnish such assistance at no additional cost to the Owner.

C. All pipe, fittings, and gaskets used in potable water systems shall be compliant with NSF/ANSI 61, 14, and 372.

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PART 2 - PRODUCTS

2.1 GENERAL

A. Extent of Work: Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable sections of Divisions 31 and 40 and as indicated. Materials in contact with potable water shall be listed as compliant with NSF/ANSI Standard 61.

B. Pipe Supports: Pipes shall be adequately supported, restrained, and anchored in accordance with Section 40 05 07 – Hangers and Supports for Process Piping, and as indicated.

C. Lining: Application, thickness, and curing of pipe lining shall be in accordance with the applicable sections of Division 40 unless otherwise indicated. Fittings and couplings shall be lined with the same material required for the pipeline in which the fittings and couplings are installed.

D. Coating: Application, thickness, and curing of pipe coating shall be in accordance with the applicable sections of Division unless otherwise indicated. Pipes above ground or in structures shall be field-coated in accordance with Section 09 90 00 – Painting and Coating.

E. Pressure Rating: Piping systems shall be designed for the maximum expected pressure as indicated on the drawings and individual pipe specifications.

F. Grooved Piping Systems: Piping systems with grooved joints and fittings may be provided in lieu of flanged joint systems for exposed ductile iron piping. To ensure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer. The Contractor shall make the coupling manufacturer responsible for the selection of the correct style of coupling and gasket for each individual location.

G. Tests: Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The Contractor shall be responsible for performing material tests.

H. Welding Requirements: Qualification of welding procedures used to fabricate pipe shall be in accordance with the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be submitted for the Engineer's review.

I. Welder Qualifications: Welding shall be done by skilled welders and welding operators who have adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9, by an independent local, approved testing agency not more than six (6) months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the Work shall be used in qualification tests. Qualification testing of welders and materials used during testing is part of the Work.

J. Joining Dissimilar Materials: Di-electric unions shall be used at the junction of two dissimilar metallic pipes as required by the local adopted plumbing code. It shall be the

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responsibility of the Contractor to identify any such conditions whether indicated in the Project Drawings or not. Di-electric unions shall be lead free, appropriate for the two dissimilar metals and be stamped with an approved UPC seal.

2.2 PIPE FLANGES

A. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small diameter pipes shall be in accordance with the standards indicated for these pipes. Flanges shall have pressure ranges corresponding to the following:

1. 150 PSI or less: Flanges shall conform to either AWWA C207 - Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In., Class D, or ASME B16.5 - Pipe Flanges and Flanged Fittings, 150 lb. class.

2. 150 to 275 PSI: Flanges shall conform to either AWWA C207 Class E or Class F, or ASME B16.5 150 lb. class.

3. 275 to 700 PSI: Flanges shall conform to ASME B16.5, 300 lb. class.

4. AWWA flanges shall not be exposed to test pressures greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

B. Blind Flanges: Blind flanges shall be in accordance with AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 12-inches and greater shall be provided with lifting eyes in the form of welded or screwed eye bolts.

C. Flange Coating: Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts: Bolts and nuts shall conform to Section 05 50 00 – Metal Fabrications. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

E. Insulating Flanges: Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

2.3 INSULATING CONNECTIONS

A. Insulating Flange Sets: Unless otherwise specified, insulating flange sets shall be provided at all locations where dissimilar metals are connected. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers, and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2 inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2 inch, insulating sleeves and washers shall be two (2) pieces and shall be made of polyethylene or phenolic material. Steel washers shall be in accordance with ASTM A 325 - Structural

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Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.

1. Insulating Flange Manufacturers, or equal

    a. JM Red Devil, Type E

    b. Maloney Pipeline Products Co., Houston

    c. PSI Products, Inc., (Frost Engineering Service Co., Costa Mesa, California).

B. Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved. Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

C. Insulating Sleeve Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket, which assembles over a sleeve of an insulating compound material, compatible with the fluid service, in order to obtain insulation of all coupling metal parts from the pipe.

2.4 SOLID COPPER PIPE CONNECTIONS

A. Solid Filler Materials: ASTM B 32 lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS AS.B, BCUP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated, and AWS AS.B, Bag 1, silver alloy for refrigerant piping, unless otherwise indicated.

2.5 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. Cast mechanical-type couplings shall be provided where indicated. The couplings shall conform to the requirements of AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to the requirements of Section 05 50 00 – Metal Fabrications. Mechanical-type couplings shall be bonded. The Contractor shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To ensure uniform and compatible piping components, grooved fittings, couplings, and valves shall be furnished by the same manufacturer as the coupling. Grooving tools shall be of the same manufacturer as the grooved components.

B. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations.

C. The wall thickness of grooved piping shall conform to the coupling manufacturer’s recommendations to suit the highest expected pressure.

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D. To avoid stress on equipment, equipment connections with mechanical-type couplings shall have rigid-grooved couplings or flexible type coupling with harness (in sizes where rigid couplings are not available), unless thrust restraint is provided by other means.

E. Manufacturers of couplings for steel pipe, or equal

1. Gustin-Bacon (Aeroquip Corp.) (banded or grooved)

2. Victaulic Style 41 or 44 (banded, flexible)

3. Victaulic Style 77 (grooved, flexible)

4. Victaulic Style 07 or HP-70 (grooved, rigid)

F. Manufacturers of ductile iron pipe couplings, or equal

1. Gustin-Bacon, (Aeroquip Corp.)

2. Victaulic Style 31 (flexible or rigid grooving)

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

2.6 SLEEVE-TYPE COUPLINGS

A. Sleeve-type couplings shall be provided where indicated. The Contractor will not be allowed to substitute a sleeve-split coupling for the sleeve coupling unless approved by the Engineer.

B. Construction: Sleeve couplings shall be in accordance with AWWA C219 - Standard for Bolted Sleeve- Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated.

1. The middle ring shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

2. The coupling shall be either 5- or 7- inches long for sizes up to and including 30-inches and 10-inches long for sizes greater than 30-inches, for standard steel couplings, and 16-inches long for long-sleeve couplings.

3. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket.

4. Bolts and nuts shall conform to the requirements of Section 05 50 00 – Metal Fabrications.

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C. Pipe Preparation: Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12-inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof- test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

2.7 GASKETS

A. Gaskets for wastewater and sewerage applications shall be Buna N (NBR), Grade 60, or equivalent suitable elastomer and shall be rated for a temperature range of -30°F to 150°F.

B. Gaskets for drinking water and tertiary effluent applications shall be SBR (Styrene Butadiene) or EPDM (Ethylene Propylene Diene Monomer), and suitable for a temperature range of -30 °F to 150 °F minimum. Provide non-asbestos compressed fiber gaskets when system working pressure exceeds 150 psi.

C. All gaskets for potable water systems shall be NSF/ANSI 61 Certified.

D. Gaskets for compressed air pipe shall be Viton and rated for a working temperature of 300 °F, minimum.

E. The flanged joint rating for pressure and temperature performance shall match or exceed the working pressure and temperature of the pipe system in which it is installed.

F. Flange gaskets in ductile iron pipe shall be full-faced type with a minimum thickness of 1/8 inch. Flanged gaskets shall be the high-performance type, satisfying the special requirements of ANSI/AWWA C111/A21.11, Appendix C, Section C.2, with a minimum of two bulb type rings molded into both faces of the gasket.

G. Flange gaskets for steel and stainless-steel pipe shall comply with ASME B16.21 for ASME B16.5 flanged joints. Gaskets shall be full-face type with a minimum thickness of 1/8 inch for Class 150 pipe flanges and fittings.

H. Flange gaskets for Sch. 40 and Sch. 80 PVC and CPVC shall be 1/8” thick, full face gaskets with ANSI Class 150 bolt pattern and a Shore “A” Durometer of approximately 70.

I. Gaskets in bell ends of PVC gravity and pressure pipe shall be Rieber-style with a steel insert in the gasket that complies with ASTM F477. Gaskets in ductile iron pipe bells shall be a molded synthetic rubber ring gasket consisting of two hardnesses, shaped to fit the gasket socket in accordance with ANSI/AWWA C111/A21.11.

J. Gaskets for flanged joints used in chemicals, ozone, solvents, hydrocarbons, steam, chlorine and other fluids shall be made of materials compatible with the service, pressure, and temperature.

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2.8 FLANGE COUPLING ADAPTERS

A. Flange coupling adapters shall only be used where shown on the drawings or accepted by the Engineer. Otherwise, the Contractor shall only use dismantling joints if additional flexibility is required for the pipe installation.

B. Flange coupling adapters shall be designed for a water working pressure not less than the design pressure of the pipe on which they are to be installed and shall be equipped with suitable rubber gaskets.

C. Couplings shall be Romac RFCA, or equal. Thrust ties shall be provided for all flexible couplings to sustain the force developed by the test pressure. Anchor studs will not be acceptable.

2.9 MECHANICAL JOINT ADAPTERS

A. Flanged joints shall not be allowed in buried applications unless shown on the drawings. If there is limited space for installation, mechanical joint fittings may be connected with a MJ x MJ adapter.

B. MJ adapters and spacers shall be constructed of high strength ductile iron that complies with ASTM A536 Grade 65-45-12.

C. The hardware kit shall consist of Type 316 t-head and pigtail bolts.

D. Gasket materials shall comply with the gasket section of this specification section.

E. Adapter shall be rated for 350 psi working pressure in sizes 3” to 24” and 250 psi working pressure in sizes 30” through 36”.

2.10 FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, pumps, and other vibrating equipment and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged reinforced neoprene or butyl single-arched spools, rated for a working pressure of 40 to 150 psi, or reinforced flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise indicated. The connectors shall be a minimum of 9-inches long, face-to-face flanges, unless otherwise indicated. The final material selection shall be approved by the manufacturer. The Contractor shall submit manufacturer's shop drawings and calculations.

B. Grooved pipe flexible mechanical couplings may be used in lieu of the above paragraph on pumps only. The Contractor shall submit manufacturer's shop drawings and calculations.

2.11 MISCELLANEOUS

A. Expansion Joints: Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to

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equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be flanged end, stainless steel, Monel, rubber, or other materials best suited for each individual service. The Contractor shall submit detailed calculations and manufacturer's Shop Drawings of all proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature, and pressure ratings.

B. Piping Connection to Equipment: Where piping connects to mechanical equipment, such as pumps, compressors, and blowers, the piping shall be brought to the equipment connection aligned and perpendicular to the axis of the flange or fitting for which the piping is to be connected to the equipment. The piping shall not impose excessive stress to the equipment connection so much to cause misalignment of the equipment. The Contractor shall assign the responsibility to the equipment manufacturer to review the piping connection to the equipment and submit any modifications to the Engineer for review.

C. Restrained Joints: Provide restrained joints as identified in Drawings. Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation to prevent misalignment of the pump imparted by the thrust within the piping system. Thrust restraints systems shall be manufactured by Victaulic, “Depend-O-Lok”; Dresser, “Style 38”; Ford Meter Box Co., Inc., “Style FC1 or FC3”; and Smith-Blair, “Style 411.”

D. Pipe Threads: Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch) and be made up with Teflon tape unless otherwise indicated.

E. Air and Gas Traps: Air and gas pipes shall slope to low points and be provided with drip legs, shut-off valves, strainers, and traps. The traps shall be piped to the nearest drain. Air and gas traps shall be not less than 150 lb. iron body float type with copper or stainless-steel float. Bracket, lever, and pins shall be of stainless steel. Drain traps shall have threaded connections acceptable manufacturers include Armstrong International, Inc. and Spirax Sarco, Inc.

2.12 COUPLINGS

A. Flexible Pipe Couplings – Smith Blair OMNI 441 coupling system or approved equal. Couplings shall be lined and coated with a minimum thickness of 0.012” fusion-bonded epoxy or approved equal. Coating must comply with ASTM C213 and AWWA C550.

2.13 DISMANTLING JOINTS

A. Dismantling joints shall be Romac Style DJ400, Smith Blair Model 975 or approved equal. Dismantling joints shall be coated with fusion bonded epoxy per AWWA C213. Provide high strength stainless steel bolts, nuts, and tie rods. Use anti seize lubricant when assembling all stainless-steel hardware.

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2.14 TAPPING SADDLES

A. Tapping saddles shall have a ductile iron body meeting ASTM A536, Grade 65-45-12. Gasket shall be Nitrile Butadiene Rubber (NBR) for water and sewer service. Saddles shall have two, 2" straps constructed of Type 304 stainless steel with GMAW and GTAW welds. Stainless steel shall be passivated for corrosion resistance. Casting shall be coated with fusion bonded black nylon, 10 – 12 mils thick, with a dielectric strength of 1,000 v/mil. Threads as required for installation of instrumentation.

B. Bolts, nuts, and washers shall be Type 304 (18-8) heavy gauge stainless steel.

C. Saddles shall comply with AWWA C800 and shall have a pressure rating of 350 psi for pipe sizes up to 24 inch.

D. Provide Romac 202 service saddles or equivalent.

2.15 THRUST BLOCKS

A. Concrete to have a minimum compressive strength of 2,500 psi at 7 days. Place in accordance with plan details.

2.16 MECHANICAL RESTRAINT

A. Type: Standard mechanical joint restraint gland, restraint devices for MJ fittings and appurtenances to conform to ANSI/AWWA C111 or ANSI/AWWA C153.

B. Product: EBAA Iron Series 2000 PV (for PVC Pipe) or EBAA Iron Series 1100 Megalug (for DIP) or approved equal, and to meet requirements of ASTM F1674.

C. Application: Approved for above ground installation and below ground where specifically specified on the Plans. Also, mechanical restraint shall be installed in locations where the pipeline must be used immediately as a temporary restraint while thrust blocks cure.

D. Pipe joints shall be restrained 30 ft. or a minimum of two pipe joints (whichever is longer) upstream and downstream of a mechanically restrained fitting.

2.17 BOLTS AND ANCHORS

A. Bolts and anchors for fittings, pipe couplings, valves, piping and accessories shall comply with Section 05 50 00 – Metal Fabrications.

2.18 POLYETHYLENE PIPE WRAP

A. Polyethylene encasement shall comply with ISO 8180, ANSI A21.5, AWWA C105, and ASTM A674. Utilize Protective Wrap V-Bio or approved equal. Polyethylene encasement shall be installed on all buried pipe, valves, and fittings (including all nuts, bolts, and other apparatuses installed below grade) per manufacturers recommendations and shall meet all the requirements of AWWA C105/A21.5 standard for polyethylene encasement.

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PART 3 - EXECUTION

3.1 GENERAL

A. Piping, fittings, and appurtenances shall be installed in accordance with the requirements of applicable sections of Division 31 and Division 40. Proprietary manufactured couplings shall be installed in accordance with the coupling manufacturer's recommendation.

B. Care shall be taken to ensure that piping flanges, mechanical-type couplings, sleeve-type couplings, flexible connectors, and expansion joints are property installed as follows:

1. Gasket surfaces shall be carefully cleaned and inspected prior to making up the connection. Each gasket shall be centered properly on the contact surfaces.

2. Connections shall be installed to prevent inducing stress to the piping system or the equipment to which the piping is connected. Contact surfaces for flanges, couplings, and piping ends shall be aligned parallel, concentric, and square to each axis at the piping connections.

3. Bolts shall be initially hand-tightened with the piping connections properly aligned. Bolts shall be tightened with a torque wrench in a staggered sequence to the AISC recommended torque for the bolt material.

4. Groove ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove.

5. After installation, joints shall meet the indicated leakage rate. Flanges shall not be deformed nor cracked.

C. Soldered Pipe Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook" using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS ASB.

E. Lined Piping Systems: The lining manufacturer shall take full responsibility for the complete, final product and its application. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.

F. Core Drilling: Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and reinforcing bars.

G. Cleanup: After completion of the Work, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

H. Protective Coating: All pipes shall be coated in accordance with Section 09 90 00-Painting and Coating.

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3.2 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact Defective or damaged materials shall be replaced with new materials.

3.3 PIPING INSTALLATION

A. Cut piping accurately for fabrication to measurements established at the construction site and work into place without springing and/or forcing.

B. Remove burrs and cutting slag from pipe by reaming or other approved cleaning methods.

C. Make changes in direction with proper fittings.

D. Arrange piping so as not to interfere with the removal of other equipment, ducts, or devices. Do not block access doors, windows, or access openings. Provide unions in the piping at connections to all equipment. Unions must be accessible.

E. Make connections of dissimilar metals (such as copper and steel) with insulating couplings suitable for at least 175 psi working pressure at 250 degrees F.

F. Cap or plug open ends of pipes and equipment with PVC caps or expanding neoprene plugs to keep dirt and other foreign materials out of the system. Plugs of rags, wool, cotton, waste, or similar materials are not acceptable.

G. Install all piping systems so they can easily be drained. Provide hose bibs at low point of water lines.

H. Slope all soil and waste lines within the building at ¼-inch fall per foot in the direction of flow unless otherwise noted on drawings.

3.4 YARD PIPING INSTALLATION

A. If excavation enters an area of petroleum or other contamination, stop work and notify the Engineer for verification of piping and gasket material usage.

B. Install pipe per manufacturer's specific instructions. Do not install pipe without continuous support under the barrel or where a dry joint connection cannot be made.

C. Install pipe with a minimum of 5 feet of cover or as indicated on the drawings. Ensure that the pipe has adequate cover from sub-grade as listed above and installed below frost depth.

D. Pipe bedding is required; bed pipe in accordance with Section 31 23 33 – Trenching and Backfilling.

E. Mechanical Joint Pipe

1. Gland shall be placed on spigot end of pipe with lip extension toward the joint, and the rubber gasket shall be slipped on the pipe with its thick edge toward the gland.

2. The gasket and joint surfaces shall be thoroughly wetted using a soapy solution made with vegetable soap or similar soap as recommended by the manufacturer.

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3. After inserting the spigot end of the pipe to full depth and pressing the gasket firmly into place in the bell, the gland shall be moved into place, the bolts inserted, and the nuts finger tightened. The nuts shall then be tightened gradually with a wrench - a half turn at a time, moving wrench from one nut to another repeating until all nuts are uniformly tight. Final tightness shall be with a torque wrench: 60 - 90 pounds torque for ¾" bolts. Install gland retainer on thrust retainer glands as recommended by the manufacturer.

F. Gravity Pipelines

1. Begin construction at the low point of the pipeline. Install pipe upgrade with the bell end upgrade.

2. Control line and grade of the pipe installation by use of a pipeline laser. Limit variance of installed pipe from design line and grade to less than 0.02 feet, unless a smaller variance is necessary to prevent a level or negative slope.

G. Pressure Pipelines: All buried pipe installations shall be capable of withstanding maximum thrust at test pressure; provide thrust blocks at each angled fitting, tee, cross, reducer, cap, and plug, or mechanically restrained joints where shown. All buried valves shall be mechanically restrained in accordance with this specification section. For thrust blocks, provide bearing area against undisturbed earth. Place such that thrust block may be removed in the future without damage to pipe or fitting. Place V-Bio polyethylene plastic between thrust blocks and fittings.

H. Furnish and install plugs or caps on pipe ends and stub-outs. Ensure watertight connection. Provide a bell end or joint suitable for making a gasketed connection when the pipeline is extended. Thrust block all pressure pipe stubs. Protect against displacement during backfilling operations and testing.

I. When pipe installation is suspended at the end of each day, ensure that no dirt or other foreign material is allowed in pipe or fittings. Block or plug the open end of the pipe to prevent creep, uplift or floating, entrance of water, dirt, or other materials.

J. Place pipe anchors on all pipes installed on slopes 20% and greater.

K. Do not operate existing or active valves without the authorization of the Engineer.

L. Install pipe end markers to surface. Pipe marker to be 2x4 wood stud, painted green for sewer, purple for reclaimed or utility water or irrigation, or blue for potable water. Attach finder wire attached to stub and 2x4.

M. Assure that continuity is maintained in locating wire, in accordance with Section 31 23 33 – Trenching and Backfilling.

3.5 WORKMANSHIP

A. Care shall be taken at all times to protect floors, stairways, and walls during the make-up, erection of piping, and placing of equipment. The Contractor shall remove all stains and repair all damage before final acceptance of the work.

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3.6 TESTING

A. Test all pressure piping according to the requirements of Section 01 74 30 – Site Pressure Pipe Testing and Disinfection.

B. Repair defects which develop under tests promptly and repeat tests. No caulking of screwed joints, cracks, or holes will be permitted. Repair leaks in screwed joints by replacing pipe or fitting or both with new material.

C. Repair leaks in copper tubing by melting out joint, thoroughly cleaning both tubing and fitting, and resoldering.

3.7 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

END OF SECTION 40 05 00

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SECTION 40 05 07- HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required for the installation of all piping and all related work required for complete pipe installations. Coordinate Work with other trades.

B. Furnish and install all pipe hangers, sleeves, supports, brackets, and other related items required to support the piping systems as required whether shown on the plans or not.

C. Test all piping systems and correct any problems found to exist.

1.2 REFERENCE STANDARDS

A. All mechanical piping systems shall conform to requirements under the latest revision of International Mechanical Code, ASA Code for Pressure Piping, and the International Building Code.

1. ASA Codes as sponsored by ASME
2. ASME B31.1 Power Piping
3. ASME B31.2 Fuel Gas Piping
4. ASME B31.3 Process Piping
5. ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron & Steel Products
6. Piping Handbook Nayyar, Mohinder L. (2000). Piping Handbook (7th Edition). McGraw-Hill.

B. Install Work in accordance with applicable provisions of codes, rules, regulations, statutes, and ordinances of governing bodies having jurisdiction. Such codes, rules, regulations, statutes, and ordinances are hereby incorporated into these specifications. Comply with specification requirements which are in excess of code requirements and not in conflict therewith.

1.3 SUBMITTALS

A. Submit shop drawings shall be in accordance with Section 01 33 00 – Submittal Procedures. Shop Drawings shall include the following information:

1. Plans and Details of pipe supports, hangers, anchors, and guides
2. Calculations for supports and anchors stamped by a Licensed Engineer in the State where equipment is to be installed.

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PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Pipe hangers shall be capable of supporting the pipe in all conditions of operation, allowing free expansion and contraction of the piping, and preventing excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.

B. Unless shown otherwise, provide vertical piping supports for all pipe except copper:

1. Support vertical piping with wrought steel riser clamps. Make adequate provision for expansion, contraction, and lateral stability.

2. Use steel extension pipe clamps for vertical pipe supports similar to Anvil Figure 261, refer to manufacturer's rated maximum loading for each size pipe. Bolt clamp securely to pipe rest, clamp end extension on building structure.

3. Where pipe sleeves extend above floor, place pipe clamps at ceiling below and support clamp end extension from inserts.

4. Use beam clamps that are of malleable iron, Anvil Figure 86 for 3/8-inch hanger rods; forged steel beam clamp, Anvil Figure 228 for hanger rod up to 1-1/2 inch.

C. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads. For temperatures other than ambient temperatures, or those listed, and for other piping materials or wall thicknesses, the pipe support spacing shall be modified in accordance with the pipe manufacturer’s recommendations. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of all loading effects. Use one of the following means of supporting horizontal piping from a wall.

1. Steel J-Hook for pipe located close to wall, up to three-inch pipe, Fee and Mason Figure 146.

2. For hanger suspension with 750 lbs. maximum loading, use light welded steel bracket with hole for one rod, 3/4-inch diameter, Fee and Mason Figure 153.

3. For pipe-roll stand support use welded-steel bracket, light for 700 lbs. maximum loading, Fee and Mason Figure 150; medium for 1,500 lbs. maximum loading, Figure 151; and heavy for 3,000 lbs. maximum loading, Figure 155.

D. Unless otherwise specified, support spacing for Steel and Copper shall conform to the following:

Nominal Pipe Diameter (inches)	Maximum Span (feet)

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1 - 1/4" and smaller	6' - 0" on center
1 - 1/2" thru 3"	8' - 0" on center
4" thru 8”	12' - 0" on center
10” and larger	20’ - 0” on center

E. Unless otherwise specified, support spacing for Ductile-Iron Pipe shall conform to the following:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
All Diameters	Two supports per pipe length or 10 feet (one of the 2 supports located at joint)

F. Unless otherwise specified, support spacing for PVC, CVC, and ABS shall conform to the following:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1" and smaller	4' - 0" on center
1 - 1/4" thru 2"	5' - 0" on center
2 - /2" thru 4"	6' - 0" on center
5" and larger	7' - 6" on center

G. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or expansion joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely in directions away from the anchored points. All components shall be structurally suitable to withstand all loads imposed.

H. Heat Transmission: Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment. Support insulated piping with pipe saddles and hangers that fit on the outside of the insulation. Do not compress or damage pipe insulation with hangers or supports.

I. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, FRP, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on PVC, FRP, and other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

J. Materials of Construction: All pipe support assemblies, including framing, hardware, and anchors, shall be steel construction, galvanized after fabrication, unless otherwise indicated.

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1. All submerged piping and top of tank walls, as well as piping, conduits, and equipment in hydraulic structures within 24-inches of the water level, shall be supported with support, assemblies, including framing, hardware, and anchors, constructed of Type 316 stainless steel, unless otherwise indicated.

2. All piping in chemical and corrosive areas, including wastewater wet wells and valve vaults, shall be supported with support assemblies, including framing, hardware, and anchors, constructed of Type 316 stainless steel or FRP, unless otherwise indicated.

K. Manufactured Supports

1. Stock Parts: Where not specifically indicated, designs which are generally accepted as exemplifying good engineering practice and use stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.

2. Manufacturers, or equal:

a. Cooper B-Line;

b. Anvil International, Inc.;

c. Bergen-Paterson Pipesupport Corp.;

d. Fee & Mason Mfg., Co.;

e. Tolco Incorporated.

f. Standon Pipe Supports Inc.

L. Galvanizing: Unless otherwise indicated, all fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

2.2 INSERTS

A. Furnish and set inserts in concrete forms; provide reinforcing rods for pipe sizes over three inches or equivalent.

B. Furnish concrete inserts as follows: Black, malleable iron, Universal type for threaded connections with lateral adjustment, Anvil Figure 279 for pipe sizes up to 3 - 1/2 inches; Anvil Figure 282 for pipe sizes up to eight inches.

2.3 SHIELDS

A. Provide shields to protect insulation in all areas. Provide approved galvanized form shields to protect insulation at areas of contact with hangers and supports. Size in accordance with shield manufacturer's recommendations.

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2.4 SLEEVES

A. Where pipes pass through floors, footings, foundations, walls, or ceilings, furnish and install pipe sleeves. Sleeves for concealed piping shall be of galvanized iron, and I.P.S. black steel pipe for exposed piping installed so as to be completely covered by escutcheons, hereinafter specified. Extend sleeves through floors 1/2 inch above finish floor.

2.5 ESCUTCHEONS

A. Fit pipe passing through walls, floors, or ceilings with escutcheons with set screws as shown on the plans. Use prime painted escutcheons where surface is to receive a paint finish; otherwise, use escutcheons that are nickel or chromium plated. Where piping is insulated, use escutcheon outside the insulation.

2.6 JOINTS

A. For screwed pipe make ends with sharp, clean tapered threads using pipe compound on male thread only. Do not use mill cut threads. Ream cut pipe to full inside diameter.

B. Welding may be done by either the arc or acetylene process conforming to the requirements of the ASME B31.1 – Power Piping.

C. For solder joints use fittings specifically made for soldering. Clean all burrs and roughen pipe to clean; solder complete around joint.

D. For grooved pipe jointing systems use Victaulic couplers or equal.

E. For no-hub cast iron pipe use double screw joint neoprene coupler.

2.7 UNIONS

A. Furnish and install unions necessary for installation and necessary to permit removal of equipment.

B. For unions in steel pipe 1-1/2 inch and smaller use malleable iron ground joint unions with brass to iron seat, galvanized or black as required.

C. For larger unions in steel pipe, use standard weight cast iron flange unions with 1/16 -inch thick gaskets, galvanized or black as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to installation of piping, verify that it will not interfere with clearances required for the erection and finish of structural members, architectural members, electrical, or mechanical items.

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B. Code Compliance: All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to seismic events and line pressures, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME 831.1 - Power Piping, except as supplemented or modified below. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.

C. Structural Members: Wherever possible, pipes shall be supported from structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the Contractor and coordinated with the Engineer. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction and shall be acceptable to the Engineer.

D. Do not cut or modify any structural members for installation of piping.

E. All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ASME B31.1 - Power Piping. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

3.2 INSERTS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Set inserts in position in advance of concrete work. Contractor to coordinate openings with reinforcing supplier prior and Engineer prior to construction. Provide reinforcement rod in concrete for inserts carrying pipe over 12-inches in diameter.

C. Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

3.3 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through potentially wet floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

C. Where piping passes through floor, ceiling, or wall, close-off space between pipe and construction with noncombustible insulation. Provide tight-fitting metal caps on both sides and caulk.

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3.4 PIPE HANGERS AND SUPPORTS

A. Appearance: Pipe supports and hangers shall be positioned to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

B. Support all piping and make adequate provisions for expansion, contraction, slope, and anchorage.

C. The use of pipe hooks, chains, or perforated metal for pipe support will not be permitted.

D. Suspend all piping in the building as shown on the plans.

1. Install hangers to provide minimum 1/2-inch clear space between finished covering and adjacent work.

E. Place a hanger within one foot of each horizontal elbow.

F. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.

G. Support horizontal soil pipe near each hub, with five feet maximum spacing between hangers.

H. Support vertical piping at every other floor. Support vertical soil pipe at each floor at hub.

I. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

J. Where practical, support riser piping independently of connected horizontal piping.

3.5 FINISHING

A. Paint exposed piping and supports in accordance with Section 09 90 00 – Painting and Coating.

END OF SECTION 40 05 07

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SECTION 40 05 19 - DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required for the installation of all ductile iron pipe, couplings, fittings, and jointing materials where shown on the Plans, including all piping installed under buildings that is connected to PVC yard piping.

B. Coordinate Work with all other trades.

1.2 REFERENCE STANDARDS

A.	AWWA C104	Cement-Mortar Lining for Ductile-Iron and Grey-Iron Pipe and Fittings for Water
B.	AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
C.	AWWA C110	Ductile-Iron and Gray-Fittings, 3 in through 48 in for water
D.	AWWA C111	Rubber Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings
E.	AWWA C115	Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges
F.	AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids
G.	AWWA C153	Grey-Iron and Ductile-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
H.	AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances

I. State Plumbing Code, as applicable.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures and Section 40 05 00 – Piping, General and include, but not limited to the following information:

1. Pipe Manufacturer information, including pipe class and pressure rating and joint design.

2. Pipe Manufacturer information regarding epoxy, glass, and cement-mortar lining, including lining thickness and descriptions of material properties.

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3. Certifications: The Contractor shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section and as specified in the referenced standard and the following supplemental requirements:

   a. Physical and chemical properties.

   b. Hydrostatic test reports.

4. Submit manufacturer's certification that pipe and fittings meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.

   1. The Contractor shall perform said material tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Contractor, provided that the Contractor's schedule is not delayed for the convenience of the Engineer.

B. Reject any pipe which does not conform to specifications or is cracked, chipped, or otherwise unacceptable.

C. Use the type, size, and strength rating of the pipe as specified in the proposal or as shown on the Plans.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe and fittings used in potable water systems shall be compliant with NSF/ANSI 61, 14, and 372.

2.2 MATERIALS

A. Use ductile iron pipe conforming to AWWA C151 pressure class 250 minimum unless otherwise required by the plans. Nominal pipe laying lengths shall be 20 ft. The pipe and associated fittings shall be of the diameter and class indicated. The interior lining shall be as indicated in the Pipe Schedule and as described below. Exterior coatings are described in 2.1.I.

B. Use Class 150 grey-iron or ductile iron fittings conforming to AWWA C153 unless otherwise required by the Plans.

C. Use flanged fittings, spools and flanged couplings for all above grade piping whether shown or not and for buried locations if indicated on the Plans to provide a complete functional pipe system. Fittings shall conform to AWWA C110, C111, and C115. All valve and equipment connections shall be flanged.

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D. Use mechanical joint fittings, spools, and couplings for all below grade piping whether shown or not and for above grade locations if mechanically restrained and shown on the Plans to provide a complete functional pipe system. Pipe and fittings shall conform to AWWA C110, C111, and C153. The pipe manufacturer shall provide gasket bolt sets for each pipe and spool provided. All buried valve connections shall be mechanical joint.

E. Joint Design: Ductile iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints, or restrained joints as required.

1. Mechanical and push-on joint shall conform to AWWA C111. Mechanical joints shall be installed with little or no deflection. Following complete assembly, the joint can be deflected as necessary.

2. Flanged joints shall conform to AWWA C115. Where threaded flanges are provided, the pipe wall thickness under the cut threads shall not be less than the calculated net thickness required for the pressure class of the pipe.

3. Restrained joints shall be “Flex-Ring” restrained joint by American Ductile Iron Pipe, “TR Flex” restrained joint by U.S. Pipe, Griffen BOLT-LOK or MECH-LOK or equal.

4. When ductile iron fittings are called out to be mechanically restrained on the Plans, mechanical restraint shall comply with Section 40 05 00 – Piping, General. In addition, the pipe joints shall be restrained 30 ft. or a minimum of two pipe joints (whichever is longer) upstream and downstream of a mechanically restrained fitting.

F. Cement-Mortar Lining: Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials used for potable water and non-potable water service (i.e. tertiary effluent) shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found fault at the Site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these specifications.

1. Cement: Cement for mortar lining shall conform to the requirements of AWWA C104; provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns that burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.

2. The minimum lining thickness shall be double the thickness defined by AWWA C104.

3. Protection of Pipe Lining/Interior: Shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with AWWA C104.

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G. Epoxy Lining: Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials used for sewer service shall be cleaned and lined in the shop with 40 mils of Protecto 401 ceramic epoxy coating or approved equal. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found fault at the Site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these specifications.

H. Exterior Coating:

1. The exterior surfaces of the pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer and finish coat conforming to the requirements of Section 09 90 00 – Painting and Coating.

2. All buried mechanical joints, piping and fittings shall be wrapped with a polyethylene encasement as specified in Section 40 05 00 – Piping, General. All buried ductile iron piping shall be provided with a bituminous tar coating on the pipe exterior.

I. Bolts and Nuts: The flange and MJ bolts shall comply with the material specified in Section 05 50 00 – Metal Fabrications.

J. Gaskets shall be as specified in Section 40 05 00 – Piping, General.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect pipe and components against dirt and damage during shipment and storage.

B. The pipe shall be handled according to the manufacturer’s specifications to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment that might damage the pipe coating/exterior is prohibited. Stockpiled pipe shall be supported on padded skids, sand or earth berms free of rock exceeding 3 inches in diameter, sandbags, or suitable means so the coating will not be damaged. The pipe shall not be rolled and shall be secured to prevent accidental rolling.

C. Keep jointing material sealed when not in use.

D. Unload and string out pipe in accordance with manufacturer's recommendations and in a manner approved by the Engineer.

3.2 INSTALLATION

A. The pipe shall be installed in accordance with AWWA C600 and per manufacturer's specific instructions. Do not install pipe without continuous support under the barrel or where a dry joint connection cannot be made.

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B. Coat all mechanical joints with low density polyethylene film sleeve as per AWWA C105, except where concrete encased as shown.

C. Where necessary to raise or lower the pipe due to unforeseen obstruction or other causes, the Engineer may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 75 percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount that will be detrimental to the strength and water tightness of the finished joint.

3.3 RUBBER GASKETED JOINTS

A. Rubber Gasketed Joints.

1. For bell end pipe, the bell end of the pipe shall be thoroughly cleaned immediately before joining the pipe, and a clean rubber gasket shall be placed in the bell groove. The spigot end of the pipe and the inside surface of the gasket shall be carefully cleaned and lubricated. The lubricant shall be suitable for lubricating the parts of the joint for assembly.

    a. For potable water pipe the lubricant shall be a compound listed as in compliance with NSF/ANSI Standard 61. The lubricant shall be nontoxic, shall not support the growth of bacteria, and shall have no deleterious effects on the gasket material. The lubricant shall not impart taste or odor of water in the pipe. Tilting of the pipe to insert the spigot into the bell will not be permitted.

2. For mechanical joint pipe, once the gasket is placed over the plain end of the pipe and prior to assembly, the gasket shall be thoroughly lubricated so the gasket will “flow” into the wedge-shaped gasket seat during tightening of the bolts.

3.4 INSTALLATION OF PIPE APPURTENANCES

A. Protection of Appurtenances: When the joining pipe is dielectric-coated, buried appurtenances shall be coated in kind. Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.

B. Installation of Valves: Valves shall be handled in a manner to prevent any injury or damage to any part of the valve. Joints shall be thoroughly cleaned and prepared prior to installation. The Contractor shall adjust all stem packing and operate each valve prior to installation to insure proper operation.

C. Valves shall be installed so that the valve stems are plumb in the location indicated.

3.5 PIPELINE TESTING

A. All pipes shall be tested in accordance with Section 01 74 20 or Section 01 74 30, as shown on the pipe test ID on the drawings. The Contractor shall furnish all test equipment, labor, material, and devices at no extra cost to the Owner. Leaks shall be repaired to the satisfaction of the Engineer, and the system shall be re-tested until no leaks are found at no extra cost to the Owner.

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END OF SECTION 40 05 19

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SECTION 40 05 23 - STAINLESS STEEL PIPE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide stainless steel pipe and appurtenances, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A.	ASTM A 312	Seamless and Welded Austenitic Stainless Steel Pipe
B.	ASTM A 409	Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service
C.	ASTM A 778	Welded, Unannealed Austenitic Stainless Steel Tubular Products
D.	ANSI/ASME B 31.1	Power Piping, and ANSI/AWWA C606.
E.	ASTM A 967	Passivation of Stainless Steel Pipe.

1.3 SUBMITTALS

A. Submit to the Engineer shop drawings in accordance with Section 40 05 00 – Piping, General.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe fittings used in potable water systems shall be compliant with NSF/ANSI 61,14, and 372.

2.2 PIPE MATERIAL

A. Unless otherwise indicated, stainless steel pipe shall be in accordance with ASTM A 312, Type 304 or 316, seamless, of the schedules indicated, with threaded and socket-weld fittings for sizes up to and including 2-1/2 inches. Threaded fittings will only be allowed in above-ground installations; all buried fittings shall be welded, no exceptions. Stainless steel pipe 3 inches in diameter and larger shall be in accordance with ASTM A 409, Type 304 or 316 as indicated on Drawings of the schedules indicated, with welded or flanged fittings.

B. All fittings shall conform to the following schedule:

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Fitting Type	Material	Standard
Threaded	Forged stainless steel per ANSI/ASME B 16.11	Type 304 & 316
Socket-Welded	Forged stainless steel, ANSI/ASME B 16.11	Type 304 & 316
Butt-Welded	Wrought stainless steel, ASTM A 403, and ANSI/ASME B 16.9	Type 304 &316
Flanged	Forged Stainless Steel, ANSI/ASME B 16.5	Type 304 & 316

C. Flanged Joints

1. Bolts shall be ASTM A320, B8M Class 1 Stainless Steel.

2. Nuts shall be ASTM A194 Grade 8M Stainless Steel.

3. Washers shall be 316 Stainless Steel.

4. Gaskets shall be Viton in air piping. Refer to Specification Section 40 05 00 – Piping, General for gasket materials in other applications.

D. Surface Treatment

1. All stainless steel pipe shall be surface treated and tested to meet ASTM A 967 Passivation Standard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Stainless steel pipe shall be installed in a neat and workmanlike manner, properly aligned and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary all piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. Installation shall be acceptable to the Engineer.

B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 40 05 07 – Hangers and Supports for Process Piping. Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

D. Preparation. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened if not true. Ends of threaded pipes shall be reamed and filed smooth. Pipe fittings shall be equally cleaned before assembly.

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3.2 PIPE JOINTS

A. Threaded Joints: Pipe threads shall conform to ANSI/ASME B 1.20.1 - Pipe Threads, General Purpose (inch), and shall be full and cleanly cut with sharp dies. Not more than three threads shall remain exposed after installation.

B. Welded Joints: Welded joints shall conform to the specifications and recommendations of ANSI/ASME B 31.1 - Power Piping. Welding shall be done by skilled and qualified welders per Section 40 05 00 – Piping, General.

1. Field welding shall be minimized to the greatest extent possible by use of couplings and prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the Site, providing the butt welds are performed only with an inert gas shielded process and that other indicated welding requirements are followed rigidly.

2. Residue, oxide, and heat stain shall be removed from any type of field weld and the affected areas adjacent by the use of stainless-steel wire brushes, followed by cleaning with an agent, followed by complete removal of the agent.

3.3 INSPECTION AND FIELD TESTING

A. Inspection: The finished installation shall be carefully inspected for proper supports, anchoring, interferences, and damage to pipe, fittings, and coating. Damage shall be repaired to the satisfaction of the Engineer.

B. Field Testing: Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour, without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The Contractor shall furnish all test equipment, labor, materials, and devices at no extra cost to the Owner. For additional testing requirements refer to Section 01 74 30 – Site Pressure Pipe Testing and Disinfection.

END OF SECTION 40 05 23

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SECTION 40 05 31 – PVC PROCESS AND YARD PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide polyvinyl chloride (PVC) pipe (pressure and gravity) and chlorinated polyvinyl chloride (CPVC) pressure pipe, complete and in place, in accordance with the Contract Documents. PVC pipe shall be schedule 40, schedule 80, SDR 21, ASTM D3034, F679, or AWWA C900/C905 and CPVC shall be schedule 80 in accordance with the Piping Schedule shown on the drawings.

B. Refer to Section 40 05 00 – Piping, General for Process Interconnections for additional requirements.

1.2 REFERENCE STANDARDS

A.	ASTM D 1785	Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
B.	ANSI/ASME B 16.5	Pipe Ranges and Flanged Fittings, Class 150
C.	ASTM D 2467	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D.	ASTM F 1498	Taper Pipe Threads 60 Degrees for Thermoplastic Pipe and Fittings
E.	ASTM D 2241	PVC Pressure Rated Pipe SDR 21 and SDR 35
F.	ASTM D 3034	PVC, SDR 21 and SDR 35 Fittings
G.	AWWA C900	PVC Pressure Pipe and Fabricated Fittings
H.	ASTM D 2241	PVC Pressure Rated Pipe
I.	ASTM D 3034	Type PSM PVC Sewer Pipe and Fittings
J.	NSF/ANSI 14	Plastics Piping System Components and Related Materials
K.	NSF/ANSI 61	Drinking Water System Components – Health Effects
L.	NSF/ANSI 372	Drinking Water System Components – Lead Content

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 40 05 00 – Piping, General for Process Interconnections, and Section 01 33 00 – Submittal Procedures.

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PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe and fittings used in potable water systems shall be compliant with NSF/ANSI 61, 14, and 372.

2.2 PIPE MATERIAL

A. PVC Schedule 40 and 80 pressure pipe, sizes ½ inch to 16-inch, ASTM D 1785.

1. Approved Use: As indicated in the Plans.

2. Pipe: Schedule 40 and Schedule 80 pipe shall be iron pipe size (IPS), made from all new rigid polyvinyl chloride compounds with a cell class of 12454 as per ASTM D 1784. Pipe shall be NSF 61 compliant if indicated in the pipe schedule on the drawings. Operating temperature will be less than 140 degrees F.

3. Joints:

a. Pipe joints shall be solvent-welded type with solvent cement and primer as recommended by the pipe manufacturer for the chemical to be used in the pipe. Solvent cements shall comply with ASTM D 2564. Primers shall comply with ASTM F656.

b. Schedule 80 screwed joints that are necessary to match up to threaded valves or fittings shall be made up with appropriate thread sealant, either paste or tape.

c. Flanged joints shall be made with Van-Stone type flanged connections.

4. Fittings:

a. Schedule 80 Fittings: Injection molded PVC Schedule 80 fittings shall conform to ASTM D 2467; threaded fittings shall conform to ASTM D 2464. Fittings shall conform to NSF International Standard 61 if indicated on the drawings.

b. Schedule 40 Fittings: Injection molded PVC Schedule 40 fittings shall comply with ASTM D 2466.

c. Flanged Fittings: Flanged fittings shall be Van-Stone type, Schedule 80 fabricated PVC fittings with 150 lb. flanges conforming to ANSI/ASME B 16.5. Gaskets shall be ANSI 150 lb. full face, 1/8-inch thick Plain Rubber SBR with NSF 61 Certification for water and Niltrile Buna-N for wastewater service. Gasket material shall be suitable for the chemical service shall be provided.

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B. CPVC Pressure Pipe, sizes ½ inch to 8-inch, ASTM F 441.

1. Approved Use: As indicated in the Plans.

2. Schedule 40 and Schedule 80 pipe (iron pipe size) shall be made with a CPVC compound having a minimum cell classification of 24448, and shall be third party certified to NSF 14.

3. Fittings: CPVC Schedule 80 socket fittings shall conform to ASTM F439; Schedule 80 threaded fittings shall conform to ASTM F437. All fittings must be third party certified to NSF 14. CPVC Schedule 80 fabricated fittings shall be reinforced with fiberglass reinforced plastic (FRP). All CPVC fittings shall be molded or fabricated from a CPVC compound that is compatible with the pipe material.

C. PVC Pressure Pipe Sizes 4-inch through 60-inch for Water Distribution, ANSI/AWWA C900.

1. Approved Use: As indicated in the Plans.

2. Dimension Ratio: DR 18.

3. Joint: Bell and spigot end with ASTM F 477-02 elastomeric gaskets.

4. Fittings: Ductile Iron as per Section 40 05 19 – Ductile Iron Pipe and Fittings.

D. PVC SDR 35 Gravity Sewer Pipe, Sizes 4 inch to 15-inch, ASTM D 3034.

1. Approved Use: As indicated in the Plans.

2. Pipe: Pipe shall be manufactured from virgin rigid PVC compounds with a cell class of 12364 in accordance with ASTM D 1784. Pipe shall conform to ASTM D 3034 for gasket pipe with a minimum pipe stiffness of 46.

3. Joints: Elastomeric gasket joints with ASTM F477 elastomeric gaskets.

4. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668.

E. COUPLINGS

1. Couplings shall be in accordance with Section 40 05 00 – Piping, General for Process Interconnections

F. THRUST BLOCKS

1. Thrust blocks shall be in accordance with Section 40 05 00 – Piping, General for Process Interconnections.

G. MECHANICAL RESTRAINT

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1. Mechanical restraint shall be in accordance with Section 40 05 00 – Piping, General for Process Interconnections.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect pipe and components against dirt, damage and excessive sunlight during shipment and storage. Handle and store pipe to prevent damage or contamination.

B. Verify compatibility of pipe type and fittings prior to installation.

C. Keep jointing material sealed when not in use. Store gaskets in a cool, well-ventilated place and do not expose to the direct rays of the sun until immediately before joint assembly.

3.2 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed and filed smooth. Pipe fittings shall be equally cleaned before assembly.

3.3 INSTALLATION

A. PVC pipe shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. It is recommended that the Contractor obtain the assistance of the pipe manufacturer's field representative to instruct the pipe fitters in the correct installation and support of PVC piping.

B. Install pipe as per manufacturer's specific instructions. Do not install buried pipe without continuous support under the barrel or where a dry joint connection cannot be made.

C. Install buried pipe with cover indicated in the plans. Ensure that the pipe has adequate cover from subgrade and is installed below frost depth.

D. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 40 05 07 – Hangers and Supports for Process Piping. Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature changes.

E. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection. Valves and flanges attached to PVC pipe shall be provided with adequate supports.

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F. Control line and grade of the pipe installation by use of a pipeline laser. Limit variance of installed pipe from design line and grade to less than 0.02 feet, unless a smaller variance is necessary to prevent a level or negative slope.

G. Furnish and install plugs or caps on pipe ends and stub-outs. Insure watertight connection. Provide a bell end or joint suitable for making a gasketed connection when the pipeline is extended. Thrust block all pressure pipe stubs. Protect against displacement during backfilling operations and testing.

H. If excavation enters an area of petroleum or other contamination, stop Work and notify the Engineer for verification of piping and gasket material usage.

I. When pipe installation is suspended, assure that no dirt or other foreign material is allowed in pipe or fittings. Block or plug the open end of the pipe to prevent creep, uplift or floating, entrance of water, dirt, or other materials.

J. Joint Gap: Rubber gasket pipe shall be installed with maximum joint gaps not exceeding 75% of the manufacturer's recommended gap, at any point around the internal joint perimeter. Joint gaps shall be internally verified for each joint.

K. Place thrust blocks at each angled fitting, tee, cross, reducer, cap, plug, and valve. Provide bearing area against undisturbed earth. Place such that thrust block may be removed in the future without damage to pipe or fitting. Place 6 mil polyethylene plastic between thrust blocks and fittings.

1. Concrete thrust blocks shall be cured one (1) day before the pipeline may be filled with water, and three (3) days before the pipeline may be pressurized.

L. Deflection: Long radius curves may be constructed by pulling the pipe at the joints. The maximum deflection angle at a pulled joint shall not exceed one degree (1°) or as recommended by the manufacturer, as long as the maximum joint gap does not exceed 75% of the manufacturer's recommended gap.

M. Do not operate existing or active valves without the authorization of the Engineer.

N. Pipe bedding is required, bed pipe in accordance with Section 31 23 33 – Trenching and Backfilling.

O. Except as required for backfilling, prohibit walking or working on the pipe until backfilling of the trench has been completed. Provide temporary bridging over pipe as necessary to provide crossings for workers or equipment.

P. Assure that continuity is maintained in locating wire, in accordance with Section 31 23 33 – Trenching and Backfilling.

3.4 PIPE JOINTS

A. Threaded Joints: Pipe threads shall conform to ASTM F 1498 - Taper Pipe Threads 60 Degrees for Thermoplastic Pipe and Fittings, and shall be full and cleanly cut with sharp dies or molded. Joints shall be made with Teflon tape or thread sealant.

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B. Solvent-Welded Joints: Solvent-welded joints shall be made with fresh primer and solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed at all times and the joints shall be made up at the recommended ambient temperatures, to the pipe or cement manufacturer's written recommendations. Pipe ends shall be inserted to the full depth of the socket.

C. Flange Joints: Flanged joints shall be made with gaskets and Type 316 stainless steel bolts and nuts. Care shall be taken not to over-torque the bolts, in accordance with the manufacturer's written recommendations.

D. Mechanical Joints: As per Section 40 05 00 – Piping, General for Process Interconnections.

3.5 INSPECTION AND FIELD TESTING

A. Inspection: Finished installations shall be carefully inspected for proper joints and sufficient supports, anchoring, interferences, and damage to pipe, fittings, and coating. Damage shall be repaired to the satisfaction of the Engineer.

B. Field Testing: The Contractor shall allow adequate time for the solvent cement joints to cure. Curing time shall be per the solvent cement manufacturer's recommendation. Prior to enclosure or burying, piping systems shall be pressure tested as required in 40 05 00 – Piping, General for Process Interconnections, without exceeding the tolerances listed in the Piping Schedule. Caution - Do not use air or gas for testing PVC pipe. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The Contractor shall furnish all test equipment, labor, materials, and devices.

C. Leakage shall be determined by loss of pressure. Fixtures, devices, or other accessories that would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines shall be plugged or capped as appropriate during the testing procedures.

D. Leaks shall be repaired to the satisfaction of the Engineer, and the system shall be re-tested until no leaks are found at Contractor’s expense.

E. Disinfect 1W and 2W water service lines in accordance with Section 33 01 12 – Inspection and Testing of Water Utilities.

END OF SECTION 40 05 31

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SECTION 40 05 51 - VALVES, GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all valves and valve actuators pertaining to this Work as outlined in Contract Documents. Valves and actuators in particular locations may require a combination of units, sensors, and controls indicated in other sections of the Specifications.

C. Where a valve is to be supported by means other than the piping to which it is attached, the Contractor shall obtain from the valve manufacturer a design for support and foundation that satisfies the criteria in Section 43 05 01 – Equipment General Provisions. The design, including drawings and calculations sealed by an engineer, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.

D. Unit Responsibility: A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the Contractor shall be responsible to the Owner for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.

E. Single Manufacturer: Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 REFERENCE STANDARDS

A.	ANSI B1.20.1	Pipe Threads, General Purpose
B.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings
C.	ANSI B16.5	Pipe Flanges and Flanged Fittings
D.	ANSI B16.18	Cast Copper Alloy Solder Joint Pressure Fittings Class 25, 125, 250 and 800
E.	AWWA C111	Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
F.	AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 through 144 IN
G.	NEMA	Motors and Generators

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1.3 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Shop Drawings shall contain the following information:

1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.

2. Complete information on valve actuator, including size, manufacturer, number, limit switches, and mounting.

3. Cavitation limits for control valves.

4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.

5. Data in accordance with Section 40 05 93 – Process Equipment for electric motor-actuated valves.

6. Complete wiring diagrams and control system schematics.

7. Valve Labeling: A schedule of valves to be furnished with stainless steel tags, indicating in each case the valve location and the proposed wording for the label.

8. Certification that products being used under meet requirements of standards referenced.

C. Operation and Maintenance Data: Provide in accordance with Section 01 78 23 – Operation Maintenance Data.

D. Spare Parts List: A Spare Parts List shall contain the required information for each valve assembly, where indicated.

E. Factory Test Data: Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Valve manufacturers shall have a successful record of not less than five (5) years in the manufacture of the valves indicated.

B. Valve Testing: As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3-inches in diameter and smaller shall be tested in accordance with manufacturer's standard, larger valves shall be factory tested as follows:

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1. Hydrostatic Testing: Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be at 73-degrees, higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. Seat Testing: Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.

3. Performance Testing: Valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.

C. Certification: Prior to shipment, the Contractor shall submit for valves over 12- inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

PART 2 - PRODUCTS

2.1 GENERAL

A. All valves used in potable water systems shall be NSF/ANSI 61 certified and compliant with 14 and 372.

2.2 PRODUCTS

A. Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Gate valves 18-inches and larger or where chain wheel is required, shall be furnished with spur gear and hand wheel. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.

B. Valve Actuators: Unless otherwise indicated, valve actuators shall be in accordance with Section 40 05 57 – Actuators for Process Valves and Gates.

C. Protective Coating: The exterior surfaces of all valves and the wet interior surfaces of ferrous valves of sizes 4-inches and larger shall be coated in accordance with manufacturer’s written instructions. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment. Flange faces of valves shall not be epoxy coated.

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D. Valve Labeling: Except when such requirement is waived by the Engineer in writing, a label shall be provided on shut-off valves and control valves except for hose bibbs. The label shall be of 1/16-inch plastic or stainless steel, minimum 2-inches by 4-inches in size and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the Engineer.

2.3 MATERIALS

A. Materials shall be suitable for the intended application. Materials in contact with potable water shall be listed as compliant with NSF Standard 61. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:

1. Cast Iron: Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. Ductile Iron: ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

3. Steel: ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High- Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.

4. Bronze: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

5. Stainless Steel: Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.

6. PVC: Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.

7. CPVC: Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.

2.4 VALVE CONSTRUCTION

A. Bodies: Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated and be rated for the maximum temperature and pressure to which the valve will be subjected.

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B. Valve End Connections: Unless otherwise indicated, valves 2-1/2 inches diameter and smaller may be provided with threaded end connections. Valves 3-inches and larger shall have flanged end connections for above grade installations and mechanical joint connections for below grade.

C. Bonnets: Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.

D. Stems: Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches.

E. Stem Guides: Stem guides shall be provided per the manufacturer’s recommendations. Submerged stem guides shall be 304 stainless steel.

F. Internal Parts: Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

G. Nuts and Bolts: Nuts and bolts on valve flanges and supports shall be in accordance with Section 43 05 50 – Equipment Mounting.

2.5 VALVE ACCESSORIES

A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.6 SPARE PARTS

A. The Contractor shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The Contractor shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the Owner, after expiration of the correction of defects period.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation, inspect interconnecting piping and end connections to ensure compatibility.

B. Prior to installation, inspect and verify condition of valve and appurtenances. Installation constitutes installer's acceptance of product condition for satisfactory installation.

C. Ensure exposed piping is sufficiently supported to bear weight of valve when it is installed.

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3.2 PREPARATION

A. Correct defects or conditions, which may interfere with or prevent a satisfactory installation.

3.3 VALVE INSTALLATION

A. Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as indicated. Gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. All buried valves shall be mechanically restrained as per Section 40 05 00 – Piping, General.

C. Access: Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.

D. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the Contractor shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

END OF SECTION 40 05 51

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SECTION 40 05 57 – ACTUATORS FOR PROCESS VALVES AND GATES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide all valve actuators and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all valves and gates, except where otherwise indicated in the Contract Documents. This Section includes manual operators, and mechanical, gear type limit switches.

C. Unit Responsibility: A single manufacturer shall be responsible for furnishing and coordinating design, assembly, testing, and installation of each type of valve and gate; however, the Contractor shall be responsible to the Owner for compliance with the requirements of each valve and gate section.

D. Single Manufacturer: Where two or more valve or gate actuators of the same type or size are required, the actuators shall all be produced by the same Manufacturer.

1.2 SUBMITTALS

A. Submittals shall be furnished in accordance with Section 01 33 00 – Submittal Procedures and Section 40 05 51 - Valves, General.

B. Shop Drawings: Shop Drawings of all actuators shall be submitted together with the valve and gate submittals as a complete package.

1. Manufacturer’s published installation instructions.

2. Submit Operation and Maintenance Manuals in accordance with Section 01 78 23 – Operation and Maintenance Data.

3. Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. All valve and gate actuators shall comply with the requirements of Section 40 05 51 – Valves, General.

B. The Contractor shall furnish all actuators complete and operable with mounting hardware, handwheels, levers, chains, and extensions, as applicable. All actuators shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering.

C. Where indicated, certain valves and gates may be provided with actuators manufactured by the valve or gate Manufacturer. Where actuators are furnished by different

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manufacturers, the Contractor shall coordinate selection to have the fewest number of manufacturers possible.

D. Materials: All actuators shall be current models of the best commercial quality materials and liberally-sized for the maximum expected torque. All materials shall be suitable for the environment in which the valve or gate is to be installed.

E. Mounting: All actuators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and of ample strength. The word "open" shall be cast on each valve or actuator with an arrow indicating the direction to open in the counter-clockwise direction. All actuators shall be equipped with position indicators.

2.2 MANUAL ACTUATORS

A. Unless otherwise indicated, all valves and gates shall be furnished with manual actuators as specified below:

1. Valves up to and including 4 inches in diameter shall have direct acting lever or handwheel actuators of the manufacturer's best standard design.

2. Larger valves and gates shall have gear-assisted manual actuators, with a maximum operating pull of 60 pounds on the rim of the handwheel.

a. Above ground valves 6-inches to 24-inches in diameter may have traveling nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve.

b. Above ground valves 30-inches in diameter and greater and valves for pressures higher than 250 psi shall have totally enclosed worm-gear actuators.

~~c.~~ Buried and submerged valves, gates, and other valves as indicated shall have totally enclosed worm-gear actuators, hermetically-sealed water-tight and grease-packed.

B. Buried Valves: Unless otherwise indicated, buried valves shall have extension stems to grade, with square nuts or floor stands, position indicators, and cast-iron or steel pipe extensions with valve boxes, covers, and operating keys. Where so indicated, buried valves shall be in cast-iron, concrete, or similar valve boxes with covers of ample size to allow operation of the valve actuators. Covers of valve boxes shall be permanently labeled as required by the local Utility Company or the Engineer. Wrench-nuts shall comply with AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.

C.

D. Floor Boxes: Hot-dip galvanized cast-iron or steel floor boxes and covers to fit the slab thickness shall be provided for all operating nuts in or below concrete slabs. For operating nuts in the concrete slab, the cover shall be bronze-bushed.

E. Manual Worm-Gear Actuator: The actuator shall consist of a single or double reduction gear unit contained in a weather-proof cast-iron or steel body with cover and minimum 12-inch diameter handwheel. The actuator shall be capable of 90-degree rotation and shall be

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equipped with travel stops capable of limiting the valve opening and closing. The actuator shall consist of spur or helical gears and worm-gearing. The spur or helical gears shall be of hardened alloy steel and the worm-gear shall be alloy bronze. The worm-gear shaft and the handwheel shaft shall be of stainless steel. All gearing shall be accurately cut with hobbing machines. Ball or roller bearings shall be used throughout. Actuator output gear changes shall be mechanically possible by simply changing the exposed or helical gear set ratio without further disassembly of the actuator. All gearing shall be designed for a 100 percent overload.

PART 3 - EXECUTION

3.1 GENERAL

A. .

B. All valve and gate actuators and accessories shall be installed in accordance with Section 40 05 51 - Valves, General. Actuators shall be located to be readily accessible for operation and maintenance.

3.2 INSTALLATION

A. Install operators in accordance with manufacturer's instructions.

3.3 MANUFACTURER'S FIELD SERVICES

A. Coordinate field service work with Owner and Engineer prior to initiating such work.

B. Contractor shall furnish a qualified Manufacturer’s Representative to provide manufacturer’s field services for inspection, testing, equipment startup, and operator training.

C. Provide a 2-year warranty from date of substantial completion for the project.

END OF SECTION 40 05 57

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SECTION 40 05 62 - PLUG VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide plug valves and appurtenances, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A. ASTM A 126 Gray Iron Castings for Valves

B. ASTM A 536 Ductile Iron Castings

1.3 SUBMITTALS

A. The Contractor shall furnish submittals in accordance with Section 40 05 51 – Valves, General.

B. Contractor shall indicate actuator position for each valve in submittal. Valves installed in horizontal piping shall have the plug swing upward when opening, no exceptions.

PART 2 - PRODUCTS

2.1 ECCENTRIC PLUG VALVES (1/2 INCH TO 72-INCH)

A. Construction: Eccentric plug valves shall be of the non-lubricated, eccentric plug design with cast iron bodies conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with ANSI 125 lb. flanged ends for valves 3-inch and larger, and screwed or flanged ends for smaller sizes.

1. The plugs and shafts shall be of cast iron or ductile iron conforming to ASTM A 536 - Ductile Iron Castings, and the plugs shall be lined with a resilient coating, best suited for the specific service.

2. The body shall be lined with a suitable elastomer, where required for a special service, or it shall be epoxy-lined in accordance with Section 09 90 00 – Painting and Coating.

3. The seats shall be of nickel or stainless steel welded to the body.

4. All top and bottom shaft bearings shall be of permanently lubricated stainless steel or Teflon coated stainless steel.

5. Grit seals of Teflon, Nylatron, or similar suitable material shall be at the top and bottom plug journals.

6. Valves shall have an unobstructed port area of 100 percent of full pipe area.

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7. All eccentric plug valves shall have a pressure rating of not less than 150 psi WOG, for bubble-tight shut-off in the standard flow direction, and 25 psi WOG in the reverse flow direction.

8. When equipped with worm gear actuator, the pressure rating shall be 150 psi WOG in both directions.

9. The stem seal shall consist of field adjustable packing, replaceable without removal of the actuator, or of self-adjusting U-cup packing.

2.2 ACTUATORS

A. Unless otherwise indicated, eccentric plug valves 3-inch and smaller shall have operating levers; larger valves shall have worm-gear actuators. Valve actuators shall be in accordance with Section 40 05 57 – Actuators for Process Valves and Gates.

B. Contractor shall coordinate actuator position for ease of operation by Owner and to ensure plug shall swing upward when installed in horizontal piping.

2.3 MANUFACTURERS, OR EQUAL

A. DeZurik Corporation

B. Clow Valve Company

C. Pratt Valve

D. Val-Matic

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plug valves shall be installed in strict accordance with the manufacturer's published recommendations and the applicable provisions of Section 40 05 51 – Valves, General.

B. Unless otherwise directed, the following rules shall be observed for the installation of eccentric plug valves on sewage, sludge, or other liquid systems containing solids, silt, or fine sand:

1. The valves shall be positioned with the stem in the horizontal direction.

2. In horizontal pipelines, the plug shall swing upwards when opening, to permit flushing out of solids. Coordinate location of valve actuator so plug swings upward prior to ordering valves.

3. The orientation of the valve shall prevent the valve body from filling up with solids when closed; however, where the pressure differential through the valve exceeds 25 psi, the higher pressure for valves without worm gear, electric, or air operators shall be through the valve to force the plug against the seat.

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4. Valves which may be closed for extended periods (stand-by, bypass, or drain lines) and valves with reversed flow (higher pressure on downstream side, forcing the plug away from its seat), shall be equipped with worm gear operators for all sizes.

5. For special applications or when in doubt, consult with the manufacturer prior to installation.

END OF SECTION 40 05 62

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SECTION 40 05 65.23 – SWING CHECK VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide swing check valves and appurtenances, complete and operable, in accordance with the Contract Documents where required.

1.2 REFERENCE STANDARDS

A.	ANSI/AWWA C 508	Swing-Check Valves for Waterworks Service, 2 in. through 24 in.
B.	ASTM A 126	Gray Iron Casting for Valves, Flanges, and Pipe Fittings;
C.	ANSI/ASME B 16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 300;
D.	ASTM B 584	Copper Alloy Sand Castings for General Applications
E.	ASTM B 584 or B 148	Aluminum-Bronze Castings, or of Buna-N;
F.	ASTM B 763	Copper Alloy Sand Castings for Valve Application, or
G.	ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch);
H.	ASTM B 16	Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines.

1.3 SUBMITTALS

A. The Contractor shall furnish submittals in accordance with Section 40 05 51 – Valves, General.

PART 2 - PRODUCTS

2.1 SWING CHECK VALVES (3-INCH AND LARGER)

A. General: If not specified otherwise, swing check valves for water, sewage, sludge, and general service shall be of the outside lever and spring or weight type, in accordance with ANSI/AWWA C 508 - Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS. Valves shall have full-opening passages, designed for a water-working pressure of 150 psi. They shall have a flanged cover piece to provide access to the disc.

B. Body: The valve body and cover shall be of ductile iron conforming to ASTM A 536 – Ductile Iron Castings for Valves, Flanges, and Pipe Fittings, with flanged ends conforming to ANSI/ASME B 16.1 - Ductile Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or mechanical joint ends, as indicated.

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C. Disc: The valve disc shall be of ductile iron, or bronze conforming to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

D. Seat and Rings: The valve seat and rings shall be of stainless steel T304 or T316 Type.

E. Lining & Coating: The valve shall be lined and coated with NSF 61 Fusion Bonded Epoxy.

F. Hinge Pin: The hinge pin shall be of bronze or stainless steel.

G. Manufacturers, or equal

1. Val-Matic, 7800LW Series

2. American Flow Control (Darling)

3. APCO (Valve and Primer Corp.)

4. Kennedy Valve

5. Mueller Company

6. Crane Valves and Fittings

PART 3 - EXECUTION

3.1 GENERAL

A. Valves shall be installed in accordance with provisions of Section 40 05 51 – Valves, General.

END OF SECTION 40 05 65.23

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SECTION 40 05 71.13 – DUCKBILL CHECK VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide duckbill check valves and appurtenances, complete and operable, in accordance with the Contract Documents where required.

1.2 SUBMITTALS

A. The Contractor shall furnish submittals in accordance with Section 40 05 51 – Valves, General.

PART 2 - PRODUCTS

2.1 DUCKBILL ELASTOMERIC CHECK VALVES

A. Check valves shall be an all rubber flow operated check type with a slip-on connection. The check valve shall be designed to slip over the mounting plate attached by means of vendor furnished stainless steel clamps. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement. The bill portion shall be thinner and more flexible than the valve body and formed into a curve of 180°.

B. Manufacturer name, plant location, valve size and serial number shall be bonded to the check valve. A single manufacturer shall provide all elastomer duckbill check valves.

2.2 FUNCTION

A. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass. When backpressure exceeds the line pressure, the bill of the valve shall be forced closed.

2.3 MOUNTING PLATE

A. The mounting plate shall consist of a square backing plate with welded pipe stub located on horizontal and vertical centerline. The outside diameter of the pipe stub shall be the same as the cuff diameter of the duckbill check valve. The length of the pipe stub shall be sufficient to allow for the proper installation of the check valve. Preliminary drilling pattern on backing plate shall be provided by Manufacturer.

B. Mounting plate shall be 316 stainless steel.

2.4 MANUFACTURER OR EQUAL

A. Tideflex Technologies (Series TF-2 with mounting plate)

B. General Rubber Corporation (Flex-Valve with mounting plate)

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PART 3 - EXECUTION

3.1 INSTALLATION

A. Valves shall be installed in accordance with provisions of Section 40 05 51 – Valves, General.

B. Hardware used to mount the plate to headwall shall be specified and supplied by others. Installation of check valve onto mounting plate shall be in accordance with Manufacturer's written Installation and Operation Manual and approved submittals.

3.2 MANUFACTURER'S CUSTOMER SERVICE

A. Manufacturer's authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

B. Manufacturer shall also make customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

END OF SECTION 40 05 71.13

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SECTION 40 05 78.11 – AIR RELEASE VALVES FOR WATER AND WASTEWATER SERVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide air-release, air/vacuum, combination air valves, and appurtenances, complete and operable in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A. Commercial Standards:

1. AWWA C512 Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service

1.3 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 40 05 51 – Valves, General.

B. Technical Manual: Furnish operation and maintenance information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.4 QUALITY ASSURANCE

A. Comply with quality assurance requirements listed in Section 40 05 51 – Valves, General.

PART 2 - PRODUCTS

2.1 GENERAL

A. All valves specified in this Section shall meet the applicable requirements of Section 40 05 51 – Valves, General.

2.2 AIR-VACUUM AND AIR RELEASE VALVES

A. Air Vacuum Valves: Air/vacuum valves shall be designed to allow large quantities of air to escape out the orifice when filling a pipeline and to close when the liquid enters the valve. The Air/Vacuum Valve shall also permit large quantities of air to enter through the orifice when the pipeline is being drained to break the vacuum. The discharge orifice area shall be equal or greater than the inlet of the valve. The baffle will be designed to protect the float from direct contact of the rushing air and water to prevent the float from closing prematurely. The seat shall be fastened into the valve cover without distortion and shall be easily removed. The float shall be center guided into the seat. The valves shall be of the size indicated, with flanged or screwed ends to match piping. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise indicated. The valves shall be suitable for operation with wastewater.

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B. Air Release Valves: Air release valves shall be hydro-mechanical devices that automatically vent small pockets of air as they accumulate at high points in a system while the system is operating and pressurized. Valves shall be installed at high points within pressurized mechanical and yard piping systems. Valves shall be designed for a minimum water-working pressure of 150 psi, unless otherwise indicated. The valves shall be suitable for operation with wastewater.

C. Combination Air Valves: Combination air valves (Air/vacuum and Air Release Valves (AVAR)) shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems being filled; or re-admitting large quantities of air while a system is being drained; and venting accumulating, small pockets of air while the system is in service and under pressure.

D. Sewage Air Valves: The same general requirements shall apply as specified for air and vacuum valves. They shall have long float stems and bodies to minimize clogging. Each sewage air valve shall be furnished with the following backwash accessories, fully assembled on the valve:

1. Inlet shut-off valve;

2. Blow-off valve;

3. Clear water inlet valve;

4. Rubber supply hose; and

5. Quick connect couplings.

E. Materials of Construction: Air vacuum and air release valves shall be constructed of the following materials:

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No.	Item	Material	Reference Standard
1	Body & Cover	Cast Iron, Stainless Steel, Composite (Plastic), or Reinforced Polyamide Fiberglass	ASTM A 126
2	Float	Stainless Steel	ASTM A 240
3	Seat	Buna-N	
4	Baffle	Cast Iron	ASTM A48

F. Manufacturers, or Equal:

1. APCO
2. Val-Matic
3. Crispin
4. ARI
5. AV-Tek

G. Size: Air vacuum and air release valves are to have a 2-inch inlet size unless called out otherwise in the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Valves shall be installed in accordance with the manufacturer's printed recommendations, and with provisions of Section 40 05 51 – Valves, General.

B. Air and vacuum release valves, shall have piped outlets to the nearest acceptable drain, firmly supported, and installed in such a way as to avoid splashing and wetting of floors and obstruction of traffic.

END OF SECTION 40 05 78.11

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SECTION 40 05 93 – COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall provide electrical motors, accessories, and appurtenances complete and operable, in conformance with the individual driven equipment specifications and the Contract Documents.

B. The provision in this Section apply to all low voltage AC squirrel cage induction motors except as indicated otherwise.

C. All motors shown on the Drawings or specified in other divisions of the specifications shall in general, be furnished with the driven equipment and connected under Division 26 of the Specification.

D. If motors are specified in other divisions of the Specification, then in the event of conflicts, the more restrictive specification shall apply.

E. The Contractor shall assign to the equipment supplier the responsibility to select suitable electric motors for the equipment. The choice of motor manufacturer shall be subject to review by the Engineer. Such review will consider future availability of replacement parts and compatibility with driven equipment.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Motors shall be designed, built, and tested in accordance with the latest revision of the following standard documents. In the case of conflict between the requirements of this Section and those of the standard documents, the requirements of this Section shall prevail.

1.	NEMA MG 1	Motors and Generators
2.	ANSI/IEEE 112	Test Procedures for Polyphase Induction Motors and Generators
3.	UL l004	Motors, Electric

1.3 CONTRACTOR SUBMITTALS

A. Refer to Section 01 33 00 – Submittal Procedures and individual equipment specification requirements.

B. Submit the motor manufacturer's certification of bearing life on motors where application conditions suggest significant belt drive or thrust loads.

C. A Motor Data form (sample Form follows section) shall be submitted for each and every motor furnished under this Contract.

D. Motor outline, dimensions, and weight.

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E. Manufacturer's descriptive information relative to specified features.

F. Motor Performance Characteristics:

1. Guaranteed minimum efficiency at rated load at rated voltage.

2. Guaranteed minimum power factor at rated load at rated voltage.

3. Expected efficiency at 1/2, 3/4, and full load at rated voltage.

4. Expected power factor at 1/2, 3/4, and full load at rated voltage.

5. Motor no-load current at rated voltage.

6. Full load current at rated voltage.

7. Full load current at 110 percent voltage.

8. Starting current at rated voltage.

9. Full load speed.

10. Certified copy of test report for identical motor tested in accordance with NEMA MG 1-12.53a and IEEE Standard 112, Test Method B, showing full load efficiency and power factor not less than specified value. Motors not as specified will be rejected.

G. Vertical Motor Data:

1. Thrust bearing life

2. Type of thrust bearing lubrication.

3. Type of guide bearing lubrication.

H. Operation and Maintenance Manuals (provided before or during training of treatment plant staff), including:

1. Complete information for storage and installation.

2. Complete operating and maintenance instructions.

3. Bill of Materials.

1.4 EQUIPMENT GUARANTEE

A. Guarantees shall cover:

1. Faulty or inadequate design.

2. Improper assembly or erection.

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3. Breakage, or other failure.

4. Defective workmanship or materials

1.5 FACTORY TESTS

A. Provide factory test and test reports as listed below for all polyphase motors. For motors 7 1/2 hp and above, provide test reports for the actual motor being supplied. For motors under 7 1/2 hp, test reports of an identical motor may be provided. Perform all tests in accordance with the Procedures for Polyphase Induction Motors and Generators No. 112A and NEMA MG 1.

B. Measurements of no-load current and speed at nominal voltage and frequency

1. Measurement of locked rotor current at rated frequency.

2. Results of high-potential test.

3. Determination of efficiency and power factor at 1/2 load, 3/4 load, full-load, and service factor load.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide squirrel-cage induction motors unless otherwise noted.

B. Electric motors driving identical machines shall be identical.

C. Coordination: Provide motors especially suitable both electrically and mechanically to drive the loads specified. The speed, horsepower, torque base, bearing, shaft, insulation and enclosure shall be closely coordinated with this specification so as to provide a satisfactory, efficient drive without overloading, overheating, abnormal noise or vibration. The BHP required of the driven equipment under the most severe operating conditions for the equipment served shall not exceed the rated nameplate horsepower of the motor when operating at its rated service factor, nor shall it exceed the rated nameplate horsepower of the motor when operated at specified conditions at a service factor of 1.0. The "most severe operating conditions" shall include the full possible range of normal operating conditions but shall not include unusual conditions such as equipment failure.

D. Standards: All motors shall be in accordance with NEMA-MG 1 "T" Line, IEEE and ANSI latest revision insofar as they are applicable.

E. Service Conditions: Provide motors designed and built for long, trouble-free life in industrial service capable of operating successfully under the following application conditions:

1. 40°C maximum ambient temperature to -20 degrees Celsius minimum ambient temperature.

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2. Altitude at the facility site shall be verified.

3. Voltage variations to + 10 percent of nameplate rating.

4. Frequency variations to + 5 percent of nameplate rating.

5. Multiple speed motors suitable for use with multiple speed starter furnished.

6. Inverter duty motors suitable for use with variable frequency drives, if furnished.

F. Operating Characteristics: All motors shall be rated for full-voltage starting, NEMA Design B, normal torque, normal starting current, unless otherwise required by the driven equipment or specified.

G. Installation Environment: Provide motors suitable for the environment in which they are to be installed. Where the installation environment is specified, provide motors suitable for the environment indicated and in conformance with the specification.

H. Exempt Motors: Motors for valve operators, submersible pumps, or motors which are integral part of standard manufactured equipment, i.e., non-NEMA mounting, common shaft with driven element, or part of domestic or commercial uses apparatus may be exempted from these specifications to the extent that such variation reflects a necessary condition of motor service or a requirement of the driven equipment.

2.2 ENCLOSURES

A. Horizontal: Dripproof NEMA Standard MG 1, unless otherwise specified. Provide screen over all air openings.

B. Vertical: Motors shall be weather protected Type 1 (WP-l) NEMA Standard MG 1, with inlet and outlet openings screened unless otherwise specified.

C. TEFC and TENV: Totally enclosed fan cooled (TEFC) where specified. Provide horizontal TEFC motors with condensate drain holes. Totally enclosed non- ventilated (TENV) may be substituted for TEFC at Contractor's option.

D. Cast iron or extruded aluminum or die cast aluminum stator frames and end shields, rigid construction.

E. Heavy fabricated steel, cast iron or aluminum frames for single phase motors.

2.3 ACCESSORY REQUIREMENTS

A. Motor Assembly: Provide NEMA conduit entrance box. Provide conduit entrance box size and drilling to conform to the conduit or wiring requirements indicated on the electrical drawings. Include motor leads and all accessory leads in a common conduit entrance box.

B. Motor Leads: Provide motor leads compatible with motor insulation systems, permanently identified.

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C. Eyebolts: Provide drilling and tapping for eyebolts on all motors weighing more than 83 pounds.

D. Nameplates: Provide one or more engraved stainless steel stamped metal nameplates with the information required by NEMA-MGI-IO.38 and the following additional information:

1. Maximum ambient temperature for which motor is rated.

2. Class of insulation.

3. Service factor.

4. Bearing number.

5. Motor connection diagram if more than three leads.

6. Power rating in KW if driven equipment ratings are given in metric units.

E. Oil Lubricated Polyphase Motors: Provide lubricating oil reservoirs and sight gauges.

F. Painting: As specified in Section 43 05 01 – Equipment General Provisions.

G. Provide motor grounding lug suitable to terminate ground wire, sized as indicated.

2.4 INSULATION CLASS

A. Provide NEMA Class B insulation for all polyphase squirrel-cage induction motors, unless otherwise specified.

1. Provide additional anti-abrasion protection for non-enclosed motors, per NEMA MGl-l.27.

2. Provide additional moisture protection for enclosed motors, per NEMA MGl-20.48a.

B. Class F insulation with additional nonhygroscopic moisture protection as specified in paragraph 2.03A above may be utilized at the Contractor's option, however, the temperature rise as measured by resistance when operating at rated service factor and load shall conform to the limiting observable temperatures in NEMA-MGl, for class of insulation used.

C. Class A insulating materials shall not be utilized except in single-phase fractional horsepower motors or used in dry locations, with a standard reduction in rated temperature rise.

D. Encapsulation: Where specified. Provide insulating resin encapsulation by a molded or equivalent process in which the resin completely surrounds the conductors in the slots and end turns, leaving no voids between the conductors or adjacent stator steel. Allowable temperature rise shall not exceed the limits of NEMA-MGl.

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E. Motors to be operated from adjustable frequency drives shall be provided with insulation systems to withstand 1600-volt spikes, with dV/dt as defined in NEMA MG 1-31 and shall be labeled as “Inverter Duty”.

2.5 SERVICE FACTOR

A. Provide the service factor indicated, or NEMA standard for the specified insulation and enclosure, whichever is greater. Minimum service factor shall be 1.15 or as specified.

2.6 NEMA TYPE

A. Provide motors in accordance with standard NEMA type classifications as specified. The use of industry standard subclassifications such as "mill and Chemical" motors and similar" standard" heavy-duty designs are encouraged where they meet or exceed the specified minimum requirements.

2.7 POWER RATINGS

A. Motor horsepower or kw ratings, if indicated in the detailed equipment specifications, are minimum size acceptable.

B. Ratings indicated on the electrical drawings are for guidance only and do not limit the equipment size.

C. Frame/hp relationships shall conform to the latest NEMA standards for "T" or "U" frames and all dimensions shall meet NEMA standards.

2.8 STANDARD RATED VOLTAGE PHASE AND FREQUENCY

A. Provide motors nameplate-rated for 60 Hertz power supply as follows unless otherwise specified or shown on the drawings:

1. Motor less than 1/6 hp, single-phase, 115 volts.

2. Motors 1/6 hp through 1 hp, single phase, 115/230 volts.

3. Motors 1 hp and greater, three phase, 460 volts.

4. Multi-speed motors may have single voltage rating if manufacturer's standard.

B. Conform to the specified service conditions and the equipment specifications without reduction in the service factor.

2.9 BEARINGS AND SHAFTS

A. Motors greater than 2 HP shall have bearings designed for 17,500 hours (belted) or 100,000 hours (coupled) L-10 life.

B. Fractional Horsepower: Motors with fractional horsepower through 2 HP shall be provided with Lubricated-for-Life ball bearings.

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C. Horizontal Motors Over 2 HP: Motors larger than 2 HP shall be provided with relubricatable ball bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

D. Vertical Motors Over 2 HP: Vertical motors larger than 2 HP shall be provided with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

E. Shafts: Shafts shall be in accordance with NEMA "T" or "TS" dimensions. Long shafts shall be suitable for belt, chain or gear drive within limits established by good industrial practice and documented by NEMA. Short shafts shall be used for direct connection. Vertical motors shall be the solid-shaft type except where application requires a hollow-shaft design.

F. Inverter Duty Motors: Motors to be used in VFD applications must have bearing protection from shaft currents. Provide AEGIS shaft grounding ring, ceramic bearings or equivalent means to prevent premature bearing failure due to shaft current discharge.

2.10 DUTY CYCLE

A. Provide motors rated for continuous duty unless otherwise specified. Short time rated motors may be provided where the application is well documented by NEMA, is usual industrial practice and the driven equipment and motor is a tested combination under the specified performance conditions.

2.11 LUBRICATION

A. Horizontal polyphase motors shall be grease lubricated. The bearing housing shall be large enough to hold sufficient lubricant to minimize the need for frequent relubrication, but facilities shall be provided for adding new grease and draining out old grease without major motor disassembly. Motors 180T frame and smaller may utilize grease release fitting in lieu of grease drain plug. The bearing housing shall have long, tight, running fits or rotating seals to protect against the entrance of foreign matter into the bearings or leakage of grease out of the bearing cavity.

B. Vertical polyphase motor lubrication shall conform to the motor manufacturer's recommendations. Except as otherwise recommended, guide bearings shall be ball bearings, grease lubricated; thrust bearings shall be grease lubricated through frame 28OT, oil lubricated in larger frame sizes.

2.12 MOTOR THERMAL PROTECTION

A. Provide one heat-sensing detector per phase, embedded in the windings to provide even temperature protection on motors 75 hp or larger. Coordinate over-temperature protection system with motor starter overload relays.

B. Single Phase Motor: Single phase 120, 208, or 230 volt motor shall have integral thermal overload protection or shall be inherently current limited.

C. Thermostats: Winding thermostats shall be snap action, bi-metallic, temperature-actuated switch, and shall be factory mounted integral to the motors. Thermostats shall be provided

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with one normally closed contact. The thermostat switch point shall be precalibrated by the manufacturer.

2.13 HIGH EFFICIENCY MOTORS

A. All motors provided shall be high efficiency as specified below.

B. High efficiency motors shall have minimum and nominal efficiencies which meet or exceed the efficiencies specified below when tested in accordance with the latest version of IEEE Test Procedure 112A. Method B. using accuracy improvement by segregated loss determination including stray load loss improvement as specified in NEMA Standard MGl-12.S3A. latest revision. Minimum efficiencies shall be guaranteed in writing.

C. Single speed induction high efficiency motors, three-phase, NEMA Design B, 460V, continuous duty, 40°C ambient shall meet or exceed the efficiencies specified in the following table.

Energy Efficiency Horizontal					
		Percent Guaranteed Minimum Rated Load Efficiencies		Percent Guaranteed Minimum Rated Load Power Factor	
HP	Nominal Speed RPM	DP	TEFC	DP	TEFC
1	1,800	80.0	81.5	85.0	85.0
	1,200	78.5	79.3	74.0	74.0
1.5	3,600	79.3	81.5	86.0	86.0
	1,800	79.3	82.0	88.0	88.0
	1,200	82.5	84.0	69.5	69.5
2	3,600	82.0	84.0	88.0	88.0
	1,800	81.5	83.7	84.0	84.0
	1,200	85.5	85.5	69.0	69.0
	900	82.9	82.5	54.0	54.0
3	3,600	82.0	84.0	91.0	88.0
	1,800	84.8	86.5	79.0	79.5
	1,200	87.5	88.1	71.0	71.5
	900	84.1	82.9	62.0	62.5
5	3,600	84.8	86.5	87.0	91.5
	1,800	86.5	86.5	81.0	81.0
	1,200	87.5	88.1	75.5	75.5
	900	87.5	86.5	70.0	70.5
7.5	3,600	86.5	88.1	90.0	90.0
	1,800	89.3	89.5	86.5	86.5
	1,200	88.5	88.5	80.0	80.0
	900	87.5	86.5	72.0	72.0
10	3,600	89.3	89.5	90.0	90.0
	1,800	89.3	89.5	86.0	86.0
	1,200	89.5	89.5	80.5	81.0
	900	89.3	88.5	77.5	78.0

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2.14 ACCEPTABLE MANUFACTURER

A. U.S. Motors

B. General Electric

PART 3 - EXECUTION

3.1 ERECTION

A. Motors shall be factory installed on common bases, stands, etc., with the driven equipment. Provide suitable couplings and guards between motor and driven equipment.

B. Align and connect to driven equipment.

C. Connect motors to power supply and controllers and verify correct rotation of equipment.

3.2 INSTALLATION CHECK

A. Provide services of an experienced, competent, and authorized representative of the manufacturer to visit site of work and inspect, check, adjust if necessary, and approve equipment installation for motors 25 hp and larger.

B. Assure that equipment manufacturer's representative is present when equipment is placed in operation.

C. Verify that equipment representative revisits jobsite as often as necessary until all trouble is corrected and equipment installation and operation are satisfactory, in the opinion of the Owner.

D. The Installing Contractor shall perform the following field checks:

1. Inspect each motor installation for any deviation from rated voltage, phase, or frequency and improper installation.

2. Visually check for proper phase and ground connections. Verify that multi-voltage motors are connected for proper voltage.

3. Check winding and bearing temperature detectors and space heaters for functional operation.

4. Test for proper rotation prior to connection to the driven equipment.

5. Test insulation (megger test) of all new and re-used motors in accordance with NEMA MG-1. Test voltage shall be 1000 VAC plus twice the rated voltage of the motor.

END OF SECTION 40 05 93

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MOTOR DATA FORM

Equipment Name: _____ Equipment Number(s):_____

Site Location: _____

Nameplate Markings

Mfr: _____ Mfr Model: _____ Frame: _____ HP: _____

Volts: _____ Phase: RPM: _____ Service Factor: _____

FLA: _____ LRA: _____ Freq: _____ Ambient Temp Rating: _____°C

Time Rating:_____ (NEMA MG-10.35) Design Letter _____ (NEMA MG-1.16)

KVA Code Letter: _____ Insulation Class: _____

The following information is required for high efficiency motors only:

A. Guaranteed minimum efficiency at full load at NEMA efficiency index:

_____
(NEMA MG1-12.53B)

B. Nameplate or nominal efficiency: _____

Data Not Necessarily Marked on Name Plate

Type of enclosure: _____ Enclosure Material: _____

Temp rise: _____ °C (NEMA MG1-12.41, 42)

Space heater included: _____ Yes _____ No;

If yes, _____ Watts _____ Volts

Type of Rotor winding over-temperature protection, if specified:

Use the space below to provide additional information on other motor modifications, if specified:

_____

_____

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SECTION 40 05 97 - PIPING IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide identification for exposed piping and valves, complete and in place, in accordance with the Contract Documents.

B. All mechanical pipe systems shall have protective coatings applied in accordance with Section 09 90 00 – Painting and Coating.

1.2 REFERENCE STANDARDS

A. Commercial Standards:

1. ANSI A13.1 Scheme for the Identification of Piping Systems

1.3 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: A list of suggested labels for each valve tag and pipe system prior to fabrication.

C. The Contractor shall submit one sample of all types of identification devices to be used in the Work.

PART 2 - PRODUCTS

2.1 IDENTIFICATION OF PIPING

A. Except as indicated below for very short pipe lengths, identify exposed piping larger than 2-inches nominal size (except that all chemical pipes shall be identified) for the pipe contents and direction of flow. Pipe identification shall be manufactured by Brady, Seton, or equal.

B. Marker Type: Adhesive – Vinyl or polyester sheet with UV–resistant ink, shaped similar to pipe curvature and coated with pressure sensitive adhesive.

C. Marker Area: Sized per pipe size according to ANSI A13.1; color from the table below.

D. Lettering: Sized per pipe size according to ANSI A13.1; color from the table below.

E. Arrows: At least 2 arrows at each marker area, showing direction of flow.

F. Pipe 2-inches and smaller shall be identified by plastic plates made from laminated 3-layer plastic with engraved black letters on white background.

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G. Standard Piping Colors: Paint piping to be in accordance with Table 1 - Color Schedule and in accordance with the requirements of the Specifications for type and quality of paint as hereafter specified. This schedule is to be used only for color and identification purposes.

H. In installations where existing piping identification systems have been established, the Contractor shall follow the existing system. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the indicated system.

Mechanical Piping Color Schedule (Wastewater)
Piping Color Code

ANSI Classification	Typical Project Piping	Pipe Color	Letter Color
Flammable or Explosive Gas (Dangerous)	Natural Gas	Safety Orange	White
Liquid or Liquid Mixture	Utility Water	Light Blue	Black
	Potable Water	Blue	Black
	Raw Wastewater	Dark Green	Black
	Drains	Gray	Black
	Vents	Gray	Black
	Potable Water Hot	Med. Blue	Black

2.2 IDENTIFICATION OF VALVES AND SHORT PIPE LENGTHS

A. Identifying devices for valves and the sections of pipe that are too short to be identified with markers and arrows shall be identified with metal or plastic tags.

B. Metal tags shall be stainless steel with embossed lettering. Plastic tags shall be solid black plastic laminate with white embossed letters. Tags shall be designed to be firmly attached to the valves or short pipes or to the structure immediately adjacent to such valves or short pipes.

PART 3 - EXECUTION

3.1 GENERAL

A. All markers and identification tags shall be installed in accordance with the manufacturer's printed instructions and shall be neat and uniform in appearance. Tags and markers shall be readily visible from all normal working locations.

3.2 VALVE TAGS

A. Valve tags shall be permanently attached to the valve or structure by means of two (2) stainless steel bolts or screws.

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B. Wording on the valve tags shall describe the exact function of each valve, e.g., “HWR-BALANCING,” “CLS THROTTLING”, “PUMP SHUT-OFF,” etc.

3.3 MARKER LOCATIONS

A. Each pipe shall be marked at:

1. Intervals of 20-feet in straight runs.

2. Within 2-feet of turns, elbows, and valves.

3. On the upstream side of tees, branches, and other distribution points.

4. On both sides of walls and floors through which the piping passes.

END OF SECTION 40 05 97

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SECTION 40 61 96 – CONTROL STRATEGIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor, through the use of the Instrumentation Supplier, shall provide all instrumentation and programming required to implement the control strategies described in this Section, the functions shown on the drawings complete and operable in accordance with the Contract Documents.

1.2 DEFINITIONS

A. The following terms are used in the descriptions of PLC functions:

1. Operator Settings: Operator set or entered values shall be constants that are adjustable or set from operator displays. Examples of operator set or entered values are controller set points, batch set points, etc. Specific values that are required to be operator set are noted in the process control strategy descriptions.

2. Tunable Values: Tunable values are constants that are adjustable at engineer level displays without requiring any software reconfiguration. These values are not adjustable from operator level displays.

B. The following abbreviations are used throughout this Section:

1.	SS	Selector Switch
2.	F/R	Forward or Reverse
3.	HOR	Hand/Off/Remote
4.	FVNR	Full Voltage Non-Reversing Starter
5.	VFD	Variable Frequency Drive
6.	LR	Local Remote
7.	HOA	Hand/Off/Auto
8.	MOV	Motor Operated Valve
9.	LOS	Lock-Out Stop
10.	LCS	Local Control Station
11.	LCP	Local Control Panel

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1.3 SUBMITTALS

A. Provide submittals describing SCADA system screen development in accordance with Section 01 33 00 – Submittal Procedures and Section 40 70 00 – Instrumentation and Control, General.

B. Develop detailed loop descriptions based on the information in the Contract Documents, including the Process and Instrumentation drawings (P&ID) and Division 40 specifications.

1. For each control loop, provide a detailed functional description of the operation of the equipment, signals, and controls shown on the P&IDs:

a. Include all functions depicted or described in the Contract Documents.

b. Include the following within each loop description:

1) All requirements specific to that loop.

2) Common control requirements applicable to that loop.

3) List of all ranges, setpoints, timers, values, counters, etc.

2. Where there are similar loops with identical control, such as multiple loops for individual pumps, only 1 loop description need be developed, and the remaining loops may reference that loop description.

C. Loop description format:

1. Loop number and title.

2. References:

a. List P&IDs that are specifically referenced.

3. Abstract:

a. General description of how the loop works, what devices are involved, and how the process shall be controlled.

b. Process values, setpoints, and limits, including units and ranges:

1) Show span and range values for analog inputs and outputs, and operating point and deadband for discrete inputs.

4. Hardwired control:

a. Detailed description of the control functions at the local level.

b. Function of local operator interfaces.

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c. Operation of hardwired field pilot controls:

1) Pushbuttons.

2) Selector switches.

3) Potentiometers.

4) Pilot lights, indicators, and other displays.

5. Hardwired interlocks:

a. Explanation of the operation of system interlocks and hardwired permissive conditions.

6. PLC control:

a. Detailed description of the control functions that are under control of the PLC.

b. Operator controls and automatic controls.

c. Setpoints, alarms, etc.:

1) Include units and ranges for analog values.

2) Include span and range for analog inputs and outputs.

3) Include operating point and deadband for discrete inputs, and identify conditions where contacts are open, and when they close.

d. Control sequences.

7. Software interlocks:

a. Operation of system software interlocks.

8. HMI control:

a. Detailed description of the operator controls.

9. SCADA control:

a. Detailed description of the operator controls.

b. Setpoints, alarms, etc.

10. Indicators and alarms:

a. List any indicators and alarms specific to the loop that are not covered in the common control strategies.

11. Failure modes:

a. List any failure modes specific to the loop that are not covered in the common control strategies.

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PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 COMMON FUNCTIONS

A. Common functions that are generally applicable to all loops or to many similar loops are described under the heading "General Control Loop Functions." These functions are not repeated in the descriptions for each individual control strategy.

B. General Control Loop Functions: The following general control system functions shall be provided:

1. All analog and discrete inputs to the dialers shall be displayed. Both RUNNING and OFF input states shall be displayed.

2. All analog inputs shall have instrument failure alarms when the input is below 0 percent or above 100 percent for a tunable time initially set at 10 seconds.

3. All discrete FAIL inputs shall be alarmed for a tunable time initially set at 10 seconds. Other discrete inputs shall be alarmed as noted in the control strategy descriptions.

4. Operational Readiness Testing (ORT) should include all discrete and analog alarms as well as status alarms. This should also include all operations (e.g. lift station pump controls for lead, lag alarms, etc.). All alarm should be tested through voice or text notification as needed.

5. Where alarms are specified in the control strategy descriptions, alarms shall be initiated from the applicable inputs. If discrete inputs are not available, the specified alarms shall be initiated from the applicable analog input; alarm setpoints shall be operator adjustable.

6. All flow inputs and equipment run times shall be totalized and recorded. All totalized values shall be displayed. Runtime shall be displayed in tenths of an hour and be based on real-time accumulation.

7. When a level is less than 10 (e.g. ft, psi, mg/L, etc.) the precision shall be recorded in hundredths.

8. Displays shall be grouped functionally for ease of operation. Both analog and discrete functions associated with an item of equipment or a group of equipment shall be provided on the same display.

9. All PID control functions shall be provided with standard analog controller functions and operator interfaces including, but not limited to, the following:

a. AUTO/MANUAL mode selection: In AUTO, the output of controller shall be based on the PID control calculation. In MANUAL, the output of the

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controller shall be operator adjustable. Transfer between operational modes shall be bumpless.

b. LOCAL/REMOTE set point selection: In LOCAL, the set point shall be operator adjustable from the equipment, if applicable. In REMOTE, the set point shall be adjustable from a REMOTE set point input.

c. Set point, process variable, and controller output shall be displayed.

d. Provisions shall be included to prevent reset windup.

10. When equipment is tagged OUT OF SERVICE, by the operator all associated equipment shall have their alarms inhibited until the tagged equipment is re-tagged IN SERVICE.

11. Speed indications and speed control setpoints shall be displayed in Hz.

12. Wherever two or more pieces of equipment are provided for the same functions, for example submersible lift station pumps, the MCC shall alternate the equipment after each use.

3.2 CITY BEACH LIFT STATION

A. Reference Drawing(s): EI-701-A

B. Description: The City Beach Lift Station is comprised of a wet well, level controls, and two submersible pumps. Level controls consist of a radar level transducer in the wet well for primary level control. There are five backup floats for secondary level control and alarming on low and high wet well level. Level control instrumentation is field adjustable. Normal operation requires the pumps to alternate LEAD position after each start. The level controller shall control the operation of the pumps based on level in the wet well. In the event of PLC failure, operators shall be able to put the well into Float Mode which will change pump operation to run without the PLC using the five backup floats.

C. Float Control Mode: The operator may change the control selector switch on LCP-A100 to FLOAT. This mode shall operate the well pumps in the event of total PLC failure. While in the FLOAT position, pump operation shall be controlled using only the five level floats.

1. When the fluid in the wet well rises to the LEAD ON float, the lead pump shall be turned on. The lead pump shall remain on until the level falls below the OFF float switch.

2. When the fluid in the well rises to the LAG ON float, the LAG pump shall be turned on. The lag pump shall remain on until the level falls below the OFF float switch.

3. If the fluid in the wet well goes above the HIGH LEVEL float switch, the autodialer shall send an alarm to notify operators of high fluid level

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4. If the fluid in the wet well goes below the LOW LEVEL float switch, the pumps shall be turned off. The auto dialer shall send an alarm to notify operators of low fluid level.

D. Local Controls: From the FVNR for each pump. FVNRs are located in City Beach Lift Station motor control panel.

E. Local Manual Control Mode: The operator may run each submersible pump in manual mode by placing the HOA selector switch in the HAND position. While in the HAND position, the pump shall run continuously. Any pump may be stopped by placing the respective selector switch in the OFF position.

F. Automatic Control Selection: Automatic control mode for each submersible pump is provided by placing the HOA selector switch in the AUTO position. When in AUTO, the level controller controls the operation of the pumps.

G. Automatic Control Mode: When the pump HOA selector switch is in the AUTO position, the pump shall be controlled by the level sensor. While in the AUTO mode, the pump is controlled using wet well level as the primary control variable. The controller shall alternate the pumps after each start.

1. LEAD/LAG Selection: This setting defines which pump is the LEAD pump and LAG pump.

2. The level settings can be changed by the operator. The following pump control strategies are available while in the AUTO control mode:

a. When the fluid level in the wet well rises to the LEAD pump start level, the LEAD pump is energized. The pump remains energized until the fluid level in the wet well falls to the pump shutoff level.

b. If the fluid level in the wet well continues to rise until it reaches the LAG pump start level, the LAG pump is energized. The pump remains energized until the fluid level in the wet well falls to the pump shutoff level.

c. If the fluid level in the wet well rises to the HIGH level, a high-water level alarm shall be sent to the SCADA system. The pumps remain energized until the fluid level in the wet well falls to the pump shutoff level. Once the water level falls back below the HIGH level, a notice of normal water level shall be sent to the SCADA system. The high-water alarm must be cleared manually in the SCADA system.

1) If the HIGH float switch is activated and no pumps are on, then the primary level sensor may have failed. All pumps shall be turned on. If all of the pumps are already running when the HIGH float switch is activated, then nothing additional needs to be done besides sending a HIGH level alarm.

d. If the fluid level in the wet well falls to the LOW alarm level, a low water alarm shall be sent to the SCADA system, and all of the pumps shall shutoff.

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e. If a pump fails anytime it is running or commanded to run, a FAIL alarm is annunciated at the HMI for that pump. If the pump that failed was in the LEAD position, then the LAG pump is promoted to LEAD position. A pump failure alarm is also sent to the SCADA system.

H. SCADA Control:

1. Same as Automatic Control. The LEAD, LAG, HIGH, Pump Off and LOW water levels shall be adjustable from SCADA.

2. The lag delay times shall be adjustable from SCADA, including pump, water level, and alarm lag delay times.

I. Interlocks: A pump that is running shall be interlocked to stop on any of the following conditions:

1. FVNR fault.

2. Failure of any of the safety shutdown functions of the pumps.

3. Additional as provided by the manufacturers.

J. Local Indicators: As a minimum, the following indicators shall be provided at the FVNR:

1. HOA switch.

2. Pump running.

3. Pump stopped.

4. Pump fault.

5. As a minimum, the following indicators shall be indicated on the level controller:

a. Wet well level in hundredths of a foot.

K. SCADA Indicators: As a minimum, the following indicators shall be provided:

1. Motor current.

2. Motor elapsed run time in tenths of an hour.

3. Pump running.

4. Pump local/remote status.

5. Pump running.

6. Pump fault.

7. Pump high temp.

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8. Pump moisture detected.

9. Wet well level.

10. Wet well high level alarm.

11. Wet well low level alarm.

12. Lift station flow rate in gallons per minute and totalized flow in gallons per day (from midnight to midnight).

13. ATS utility power.

14. ATS emergency power.

15. ATS fault.

16. Generator auto/manual.

17. Generator running.

18. Generator fault.

19. Generator current.

L. SCADA Alarms: As a minimum, the following alarms shall be provided to the SCADA system:

1. Pump fault for each pump.

2. Moisture alarm for each pump. Moisture detection switches located in the seal oil chamber detect moisture leakage through the outer shaft seal. The moisture sensor shall be wired to the pump control system to provide seal failure protection indication for the pump. A moisture detection relay for each pump shall be provided to provide alarm signal to SCADA system upon moisture detection.

3. High temperature alarm for each pump. Thermal sensors used to monitor stator temperatures by the use of three thermal switches embedded in the coils of the stator winding shall be wired to the pump control system to provide overheat protection for the motors. These sensors shall be connected to the SCADA network similar to moisture sensors to provide an alarm signal upon detection of preset HIGH temperature.

4. FVNR fault.

5. High and low water level alarms from float switches.

3.3 SUPERIOR STREET LIFT STATION

A. Reference Drawing(s): EI-701-B

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B. Description: The Superior Street Lift Station is comprised of a wet well, level controls, and two submersible pumps. Level controls consist of a radar level transducer in the wet well for primary level control. There are five backup floats for secondary level control and alarming on low and high wet well level. Level control instrumentation is field adjustable. Normal operation requires the pumps to alternate LEAD position after each start. The level controller shall control the operation of the pumps based on level in the wet well. In the event of PLC failure, operators shall be able to put the well into Float Mode which will change pump operation to run without the PLC using the five backup floats.

C. Float Control Mode: The operator may change the control selector switch on LCP-B100 to FLOAT. This mode shall operate the well pumps in the event of total PLC failure. While in the FLOAT position, pump operation shall be controlled using only the five level floats.

1. When the fluid in the wet well rises to the LEAD ON float, the lead pump shall be turned on. The lead pump shall remain on until the level falls below the OFF float switch.

2. When the fluid in the well rises to the LAG ON float, the LAG pump shall be turned on. The lag pump shall remain on until the level falls below the OFF float switch.

3. If the fluid in the wet well goes above the HIGH LEVEL float switch, the autodialer shall send an alarm to notify operators of high fluid level

4. If the fluid in the wet well goes below the LOW LEVEL float switch, the pumps shall be turned off. The auto dialer shall send an alarm to notify operators of low fluid level.

D. Local Controls: From the FVNR for each pump. FVNRs are located in Superior Street Lift Station motor control panel.

E. Local Manual Control Mode: The operator may run each submersible pump in manual mode by placing the HOA selector switch in the HAND position. While in the HAND position, the pump shall run continuously. Any pump may be stopped by placing the respective selector switch in the OFF position.

F. Automatic Control Selection: Automatic control mode for each submersible pump is provided by placing the HOA selector switch in the AUTO position. When in AUTO, the level controller controls the operation of the pumps.

G. Automatic Control Mode: When the pump HOA selector switch is in the AUTO position, the pump shall be controlled by the level sensor. While in the AUTO mode, the pump is controlled using wet well level as the primary control variable. The controller shall alternate the pumps after each start.

1. LEAD/LAG Selection: This setting defines which pump is the LEAD pump and LAG pump.

2. The level settings can be changed by the operator. The following pump control strategies are available while in the AUTO control mode:

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a. When the fluid level in the wet well rises to the LEAD pump start level, the LEAD pump is energized. The pump remains energized until the fluid level in the wet well falls to the pump shutoff level.

b. If the fluid level in the wet well continues to rise until it reaches the LAG pump start level, the LAG pump is energized. The pump remains energized until the fluid level in the wet well falls to the pump shutoff level.

c. If the fluid level in the wet well rises to the HIGH level, a high-water level alarm shall be sent to the SCADA system. The pumps remain energized until the fluid level in the wet well falls to the pump shutoff level. Once the water level falls back below the HIGH level, a notice of normal water level shall be sent to the SCADA system. The high-water alarm must be cleared manually in the SCADA system.

1) If the HIGH float switch is activated and no pumps are on, then the primary level sensor may have failed and the other level sensor should be activated and all pumps turned on. If all of the pumps are already running when the HIGH float switch is activated, then nothing additional needs to be done besides sending a HIGH level alarm.

d. If the fluid level in the wet well falls to the LOW alarm level, a low water alarm shall be sent to the SCADA system, and all of the pumps shall shutoff.

e. If a pump fails anytime it is running or commanded to run, a FAIL alarm is annunciated at the HMI for that pump. If the pump that failed was in the LEAD position, then the LAG pump is promoted to LEAD position. A pump failure alarm is also sent to the SCADA system.

H. SCADA Control:

1. Same as Automatic Control. The LEAD, LAG, HIGH, Pump Off and LOW water levels shall be adjustable from SCADA.

2. The lag delay times shall be adjustable from SCADA, including pump, water level, and alarm lag delay times.

I. Interlocks: A pump that is running shall be interlocked to stop on any of the following conditions:

1. FVNR fault.

2. Failure of any of the safety shutdown functions of the pumps.

3. Additional as provided by the manufacturers.

J. Local Indicators: As a minimum, the following indicators shall be provided at the FVNR:

1. HOA switch.

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2. Pump running.

3. Pump stopped.

4. Pump fault.

5. As a minimum, the following indicators shall be indicated on the level controller:

   a. Wet well level in hundredths of a foot.

K. SCADA Indicators: As a minimum, the following indicators shall be provided:

1. Motor current.

2. Motor elapsed run time in tenths of an hour.

3. Pump running.

4. Pump local/remote status.

5. Pump running.

6. Pump fault.

7. Pump high temp.

8. Pump moisture detected.

9. Wet well level.

10. Wet well high level alarm.

11. Wet well low level alarm.

12. Lift station flow rate in gallons per minute and totalized flow in gallons per day (from midnight to midnight).

13. ATS utility power.

14. ATS emergency power.

15. ATS fault.

16. Generator auto/manual.

17. Generator running.

18. Generator fault.

19. Generator current.

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L. SCADA Alarms: As a minimum, the following alarms shall be provided to the SCADA system:

1. Pump fault for each pump.

2. Moisture alarm for each pump. Moisture detection switches located in the seal oil chamber detect moisture leakage through the outer shaft seal. The moisture sensor shall be wired to the pump control system to provide seal failure protection indication for the pump. A moisture detection relay for each pump shall be provided to provide alarm signal to SCADA system upon moisture detection.

3. High temperature alarm for each pump. Thermal sensors used to monitor stator temperatures by the use of three thermal switches embedded in the coils of the stator winding shall be wired to the pump control system to provide overheat protection for the motors. These sensors shall be connected to the SCADA network similar to moisture sensors to provide an alarm signal upon detection of preset HIGH temperature.

4. FVNR fault.

5. High and low water level alarms from float switches.

END OF SECTION 40 61 96

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DEVICE	TAG	I/O TAGNAME	PANEL	CONTROLLER	OUTPUT TYPE	P&ID	DESCRIPTION	ANALOG SIGNAL TYPE	DISCRETE SIGNAL TYPE	MIN. ANALOG / DISCRETE 'OFF' VALUE	MAX. ANALOG / DISCRETE 'ON' VALUE	DEVICE POWER REQUIREMENTS	NOTES
LT-A100	LI	LT_A100_LI	LCP-A100	PLC-A100	AI	EI-701-A	WET WELL LEVEL	4-20 mA		0 FT	15 FT		
FVNR-A100	II	FVNR_A100_II	LCP-A100	PLC-A100	AI	EI-701-A	MOTOR CURRENT	ETHERNET					
FVNR-A100	YC	FVNR_A100_YC	LCP-A100	PLC-A100	DO	EI-701-A	RUN COMMAND	ETHERNET		STOP	RUN		
FVNR-A100	YC.RST	FVNR_A100_YC.RST	LCP-A100	PLC-A100	DO	EI-701-A	RESET	ETHERNET			RESET		
FVNR-A100	YI.LR	FVNR_A100_YI.LR	LCP-A100	PLC-A100	DI	EI-701-A	LOCAL/REMOTE	ETHERNET		LOCAL	REMOTE		
FVNR-A100	YI	FVNR_A100_YI	LCP-A100	PLC-A100	DI	EI-701-A	RUNNING	ETHERNET		NOT RUNNING	RUNNING		
FVNR-A100	YA	FVNR_A100_YA	LCP-A100	PLC-A100	DI	EI-701-A	FAULT	ETHERNET		NO FAULT	FAULT		
SLR-A100	TAH	SLR_A100_TAH	LCP-A100	PLC-A100	DI	EI-701-A	HIGH TEMPERATURE		24 VDC	NO ALARM	HIGH TEMP		
SLR-A100	MAH	SLR_A100_MAH	LCP-A100	PLC-A100	DI	EI-701-A	MOISTURE DETECTED		24 VDC	NO ALARM	MOISTURE		
FVNR-A110	II	FVNR_A110_II	LCP-A100	PLC-A100	AI	EI-701-A	MOTOR CURRENT	ETHERNET		0 A	50 A		
FVNR-A110	YC	FVNR_A110_YC	LCP-A100	PLC-A100	DO	EI-701-A	RUN COMMAND	ETHERNET		STOP	RUN		
FVNR-A110	YC.RST	FVNR_A110_YC.RST	LCP-A100	PLC-A100	DO	EI-701-A	RESET	ETHERNET			RESET		
FVNR-A110	YI.LR	FVNR_A110_YI.LR	LCP-A100	PLC-A100	DI	EI-701-A	LOCAL/REMOTE	ETHERNET		LOCAL	REMOTE		
FVNR-A110	YI	FVNR_A110_YI	LCP-A100	PLC-A100	DI	EI-701-A	RUNNING	ETHERNET		NOT RUNNING	RUNNING		
FVNR-A110	YA	FVNR_A110_YA	LCP-A100	PLC-A100	DI	EI-701-A	FAULT	ETHERNET		NO FAULT	FAULT		
SLR-A110	TAH	SLR_A110_TAH	LCP-A100	PLC-A100	DI	EI-701-A	HIGH TEMPERATURE		24 VDC	NO ALARM	HIGH TEMP		
SLR-A110	MAH	SLR_A110_MAH	LCP-A100	PLC-A100	DI	EI-701-A	MOISTURE DETECTED		24 VDC	NO ALARM	MOISTURE		
LSH-A100	LAH	LSH_A100_LAH	LCP-A100	PLC-A100	DI	EI-701-A	WET WELL HIGH LEVEL ALARM		24 VDC	NO ALARM	ALARM		
LSL-A100	LAL	LSL_A100_LAL	LCP-A100	PLC-A100	DI	EI-701-A	WET WELL LOW LEVEL ALARM		24 VDC	NO ALARM	ALARM		
FIT-A100	FQ	FIT_A100_FQ	LCP-A100	PLC-A100	DI	EI-701-A	LIFT STATION TOTAL FLOW		24 VDC			120 VAC	
FIT-A100	FI	FIT_A100_FI	LCP-A100	PLC-A100	AI	EI-701-A	LIFT STATION FLOW RATE	4-20 mA		0 GPM	1000 GPM	120 VAC	
ATS-A100	ZI.UP	ATS_A100_ZI.UP	LCP-A100	PLC-A100	DI	EI-701-A	ATS UTILITY POWER		24 VDC	-	UTILITY POWER		
ATS-A100	ZI.EP	ATS_A100_ZI.EP	LCP-A100	PLC-A100	DI	EI-701-A	ATS EMERGENCY POWER		24 VDC	-	EMERGENCY POWER		
ATS-A100	YA	ATS_A100_YA	LCP-A100	PLC-A100	DI	EI-701-A	ATS FAULT		24 VDC	NO FAULT	FAULT		
GEN-A100	YI.AM	GEN_A100_YI.AM	LCP-A100	PLC-A100	DI	EI-701-A	GENERATOR AUTO/MANUAL		24 VDC	AUTO	MANUAL		
GEN-A100	YI	GEN_A100_YI	LCP-A100	PLC-A100	DI	EI-701-A	GENERATOR RUNNING		24 VDC	NOT RUNNING	RUNNING		
GEN-A100	YA	GEN_A100_YA	LCP-A100	PLC-A100	DI	EI-701-A	GENERATOR FAULT		24 VDC	NO FAULT	FAULT		
GEN-A100	II	GEN_A100_II	LCP-A100	PLC-A100	AI	EI-701-A	GENERATOR CURRENT	4-20 mA		0 A	100 A		

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SECTION 40 70 00 – INSTRUMENTATION AND CONTROL, GENERAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. General requirements applicable to all Process Control and Instrumentation Work.

2. General requirements for process control and instrumentation submittals.

3. See Section 40 70 00.2 – Instrumentation and Control, System Description for a list of Prequalified System Integrator (SI) and a complete description of the system.

4. As specified in this Section the Contractor shall provide the following services including, but not limited to:

   a. PLC panels and panel submittals

   b. Instrumentation required for the successful completion of the project that is not explicitly provided by others. Refer to Sections 40 67 00 A and 40 70 00 A for description of equipment which is provided by the Contractor

   c. Termination of all control wiring of instrumentation in the field and in control panels.

   d. Loop testing and documentation of all instrumentation loops.

   e. System Integrator shall be responsible for:

      1) HMI software and configuration

      2) PLC software and programming

      3) SCADA system programming

      4) SCADA computer(s) hardware and installation

      5) Assist electrical contractor in performing loop tests.

      6) Control system startup, documentation, and training.

5. It is the intent of these Specifications that the entire instrumentation and control system be complete and operable. Provide all necessary material and labor for the complete system from source of power to final utilization equipment, including all connections, testing, calibration of all equipment furnished by others, as well as equipment furnished by the Contractor.

B. Related sections:

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1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

2. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.

    a. Items involving electrical, control, and instrumentation construction may be indicated on the Drawings or specified in the Specifications that do not apply specifically to electrical, control and instrumentation systems.

3. It is the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.

C. Interfaces to equipment, instruments, and other components:

1. The Drawings, Specifications, and overall design are based on preliminary information furnished by various equipment manufacturers, which identify a minimum scope of supply from the manufacturers. This information pertains to, but is not limited to, instruments, control devices, electrical equipment, packaged mechanical systems, and control equipment provided with mechanical systems.

2. Provide all material and labor needed to install the actual equipment furnished, include all costs to add any additional instruments, wiring, control system inputs/outputs, controls, interlocks, electrical hardware etc., which may be necessary to make a complete, functional installation based on the actual equipment furnished:

    a. Make all changes necessary to meet the manufacturer's wiring requirements.

3. Submit all such changes and additions to the Engineer for acceptance as specified in Section 00 72 13 – General Conditions.

4. Review the complete set of Drawings and Specifications in order to ensure that all items related to the instrumentation and control systems are completely accounted for. Include any items indicated on the Drawings or in Specifications from another discipline in the scope of Work:

    a. If a conflict between Drawings and Specifications is discovered, refer conflict to the Engineer as soon as possible for resolution.

D. All instrumentation, and control equipment and systems for the entire project to comply with the requirements specified in the Instrumentation and Control Specifications, whether referenced in the individual Equipment Specifications or not:

1. The requirements of the Instrumentation and Control Specifications apply to all Instrumentation and Control Work specified in other Specifications, including HVAC controls, packaged mechanical systems, LCPs, VCPs, etc.

2. Inform all vendors supplying instrumentation, control systems, panels, and/or equipment of the requirements of the Instrumentation and Control Specifications.

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3. The Owner is not responsible for any additional costs due to the failure of the Contractor to notify all subcontractors and suppliers of the Instrumentation and Control Specifications' requirements.

E. Contract Documents:

1. General:

a. The Drawings and Specifications are complementary and are to be used together in order to fully describe the Work.

2. Specifications:

a. Section 00 72 13 – General Conditions and Section 00 73 00 – Supplementary Conditions of the Contract Documents govern the Work.

b. These requirements are in addition to all General Requirements.

3. Contract Drawings:

a. The Instrumentation and Control Drawings show in a diagrammatic manner, the desired locations, and arrangements of the components of the Instrumentation Work. Follow the Drawings as closely as possible, use professional judgment and coordinate with the other trades to secure the best possible installation, use the entire Drawing set for construction purposes.

b. Locations of equipment, control devices, instruments, boxes, panels, etc. are approximate only, exercise professional judgment in executing the Work to ensure the best possible installation:

1) The equipment locations and dimensions indicated on the Drawings and elevations are approximate. Use the shop drawings to determine the proper layout, foundation, and pad requirements, etc. for final installation. Coordinate with all subcontractors to ensure that all instrumentation and control equipment is compatible with other equipment and space requirements. Make changes required to accommodate differences in equipment dimensions.

2) The Contractor has the freedom to select any of the named manufacturers as identified in the individual Specifications; however, the Engineer has designed the spatial equipment layout based upon a single manufacturer and has not confirmed that every named manufacturer's equipment fits in the allotted space. It is the Contractor's responsibility to ensure that the equipment being furnished fits within the defined space.

c. Installation details:

1) The Contract Drawings include installation details showing means and methods for installing instrumentation and control equipment. For cases where typical details are not provided or compatible with an installed location, develop installation details that are necessary for completing the Work, and submit these details for review by the Engineer.

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d. Schematic diagrams:

1) Schematic diagrams show control function only. Incorporate other necessary functions for proper operation and protection of the system.

2) Add slave relays, where required, to provide all necessary contacts for the control system or where needed to function as interposing relays for control voltage coordination, equipment coordination, or control system voltage drop considerations.

3) Mount all devices shown on motor controller schematic diagrams in the controller compartment enclosure, unless otherwise noted or indicated.

4) Control schematics are to be used as a guide in conjunction with the descriptive operating sequences in the Specifications. Combine all information and furnish a coordinated and fully functional control system.

F. Alternates/Alternatives:

1. Substitute item provisions as specified in Section 00 72 13 – General Conditions.

G. Changes and change orders:

1. As specified in Section 00 72 13 - General Conditions.

1.2 REFERENCES

A. See Section 40 70 00.1 – Instrumentation and Control, References and Definitions

1.3 DEFINITIONS

A. See Section 40 70 00.1 – Instrumentation and Control, References and Definitions

1.4 SYSTEM DESCRIPTION

A. See Section 40 70 00.2 – Instrumentation and Control, System Description

1.5 SUBMITTALS

A. Furnish submittals as specified in Section 01 33 00 – Submittals and this Section.

1. Furnish the submittals required by each section in the Electrical Specifications.

2. Adhere to the wiring numbering scheme specified in Section 26 05 53 – Electrical Identification throughout the Project:

a. Uniquely number each wire.

b. Wire numbers must appear on all Equipment Drawings.

3. Use equipment and instrument tags, as indicated on the Drawings, for all submittals.

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B. Submittal organization as specified in Section 01 33 00 – Submittal Procedures and this Section

C. Submittal requirements as specified in Section 01 33 00 – Submittal Procedures and this Section:

1. Furnish submittals including:

a. Project Shop Drawing submittals.

b. The Process Control and SCADA Software Submittal including control system software, programming, and screens.

c. Testing, Calibration and Start-up procedures.

d. O&M Manual as specified in Section 01 78 23 – Operation and Maintenance Data.

e. Training Submittals.

f. Record Documents.

g. Testing Documents

D. Submittal preparation as specified in Section 01 33 00 – Submittal Procedures and this Section:

E. Specific submittal requirements:

1. Control panel hardware submittal in 1 package

a. Project Shop Drawing submittals.

1) Control panel hardware submittal in 1 package with complete and detailed bills of materials:

a) Including quantity, description, manufacturer, and part number for each assembly or component for each control panel.

b) Include all items within an enclosure.

2) Furnish sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications.

3) Use equipment and instrument tags as depicted on the P&IDs for all submittals.

4) Adhere to wiring identification scheme outlined in Specification 26 05 00 – Electrical, General throughout the Project.

5) Wire numbers must appear on all equipment drawings.

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b. Requirements for physical separation between control system components and 120 VAC, 480 VAC, and medium voltage power cables.

c. UPS and battery load calculations to show that the backup capacity and time meet the specified requirements.

d. Provide a data sheet for each control system component together with a technical product brochure or bulletin.

2. O&M Manual

a. Spare parts list:

b. Control and SCADA System Software Record Documents:

1) Include electronic copies of all software and applications.

2) Navigation tree and screen shots of all SCADA screens with basic narrative.

3) Navigation tree and screen shots of all OIT screens with basic narrative

c. Instrument data sheets and cut sheets:

d. Training Submittals.

e. Record Documents.

3. Training submittals:

a. Develop and submit for review a general training plan. Include complete descriptions of all planned training classes, a preliminary training schedule, a list of all proposed instructors along with resumes, examples of proposed training manuals, and a description of any special training tools to be used (simulators, self-paced modules, personal computer-based training, etc.).

b. The Engineer will review the general training plan. Special emphasis will be placed on review of the qualifications of the proposed instructors and the timing of the individual courses to maximize their effectiveness. If, in the opinion of the Engineer, the proposed instructors are not sufficiently qualified to conduct the specified training courses, or lack experience, where required, on the specific configuration of the system, provide more qualified instructors.

4. Record documents:

a. Furnish as specified in Section 01 77 00 – Closeout Procedures.

b. Provide record documents of all Instrumentation Drawings.

c. Shop drawings:

d. Review and corrections:

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1) Correct any record documents or other documents found to be incomplete, not accurate, of poor quality, or containing errors.

e. Control Panel Drawings

f. Control System Diagram:

1) Submit a complete set of control system diagrams including the following information:

a) All PLCs, workstations, printers, communication devices, and communication links:

2) All cables required for communication requirements.

5. Testing, Calibration, and Start-up Submittal:

a. General testing submittal requirements are specified in this Section and other Sections.

b. Test Procedure Submittals:

1) Submit the proposed procedures to be followed during tests of the PCIS and its components in two parts:

a) Preliminary Submittal: Outline of the specific proposed tests and examples of proposed forms and checklists.

b) Detailed Submittal: After successful review of the Preliminary Submittal, submit the proposed detailed test procedures, forms, and checklists. Include a statement of test objectives with the test procedures.

c. Provide certified and witnessed test and calibration checklists for any of the following tests:

1) Calibration, adjustment, and test details for all components and systems.

2) Factory Acceptance Tests (FAT).

3) Site Acceptance Test (SAT)

4) Operational Readiness Test (ORT).

d. Test reports:

1) As specified in Section 01 33 00 – Submittal Procedures.

1.2 QUALITY ASSURANCE

A. Manufacture instruments at facilities certified to the quality standards of ISO 9001.

B. Furnish all equipment listed by and bearing the label of UL or of an independent testing laboratory acceptable to the Engineer and the Authority Having Jurisdiction.

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C. The panel provider must have their own operating UL listed panel fabrication facility. All panels must be fabricated at this facility and meet all UL 508/508A requirements.

D. System Integration:

1. The Contractor, through the use of a pre-qualified SI, is responsible for the implementation of the PCIS and the integration of the PCIS with other required instrumentation and control devices.

2. The contractor assumes full responsibility, working with the SI where applicable, to perform all work to select, furnish, install, test, calibrate, and place into operation all instrumentation, controls, telemetry equipment, control panels, and SCADA system including application software, for a complete, integrated and functional PCIS system.

3. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the SI be responsible for the integration of the PCIS with existing devices and devices provided under the Contract Documents with the objective of providing a completely integrated control system.

E. Hazardous Location Rating of Equipment: Equipment manufacturer shall reference the hazardous-area classification drawing in the Contract Documents and provide equipment in compliance with the defined NEC- classification requirements. It will be the manufacturer's sole responsibility to submit equipment in compliance with the Contract Documents, NFPA 820, and NEC requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store all equipment and materials delivered to the job site in a location that will not interfere with the construction or the Owner’s operations.

B. Shipping precautions:

1. After completion of shop assembly, successful FAT, pack all equipment, cabinets, panels, and consoles in protective crates and enclose in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture.

2. Place dehumidifiers when required, inside the polyethylene coverings.

3. Skid-mount the equipment for final transport.

4. Provide lifting rings for moving without removing protective covering.

5. Display boxed weight on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.

C. Tagging:

1. Tag each component and/or instrument to identify its location, instrument tag number, and function in the system.

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2. Firmly attach a permanent tag indelibly machine marked with the instrument tag number, as given in the tabulation, on each piece of equipment constituting the PCIS.

3. Tag instruments immediately upon receipt in the field.

4. Prominently display identification on the outside of the package.

5. Utilize the Tag and Loop Number identifications shown on the P&IDs.

D. Delivery and inspection:

1. Deliver products in undamaged condition, in manufacturer's original container or packaging with identifying labels intact and legible. Include date of manufacture on label.

1.4 PROJECT OR SITE CONDITIONS

A. Site conditions:

1. Provide a PCIS, including all equipment, raceways and any other components required for a complete installation that meets the environmental conditions for the Site as specified in the General Requirements and below.

1.5 SEQUENCING

A. General:

1. As specified in Section 01 31 19 – Project Meetings and 01 35 13 – Special Project Procedures.

2. Testing requirements are specified in Section 40 70 00 – Instrument Calibration, and other sections.

3. General scheduling requirements are specified in Section 01 32 16 – Construction Progress Schedule.

4. Other scheduling activities to be determined between the Owner, contractor, engineer and SI

B. Training:

1. As specified in this Section.

2. Complete all training as agreed upon with the Owner, contractor, engineer and SI.

3. Within 10 days after the completion of training, submit the following:

a. A list of all Owner personnel that attended the session.

b. A copy of the training materials utilized during the lesson with all notes, diagrams, and comments.

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C. Site Acceptance Test (SAT) or Pre-commissioning test:

1. Commence after acceptance of all training, wire test, calibration tests, and loop validation tests, and all inspections have demonstrated that the PCIS complies with all Contract requirements.

2. The Programmer will assist with SAT testing for PLCs programmed by the Programmer.

3. The Programmer shall not be required to be on site, nor shall the Programmer be required to supply application software, until the loop validation tests are complete for a PLC and all prerequisites for the pre-commissioning test are completed.

4. Complete SAT test before the ORT.

D. Operational Readiness Test (ORT)

1. Complete all with the Owner, contractor, engineer and SI.

2. Confirmation by the Owner, contractor and engineer that the PCIS functions correctly and as designed.

E. Substantial completion testing: The following conditions be fulfilled before the PCIS is considered complete:

1. All submittals have been completed and approved.

2. The Owner training has been performed.

3. All required spare parts, expendable supplies, and test equipment have been delivered to the Owner.

4. The PCIS has been calibrated, loop tested and pre-commissioned.

5. The ORT has been successfully completed.

6. All debris associated with installation of instrumentation has been removed.

7. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

1.6 WARRANTY

A. Warrant the PCIS as specified in Section 00 72 00 – Standard General Conditions of the Construction Contract:

1. Provide additional warranty as specified in the individual Instrumentation and Control Specifications.

1.7 SYSTEM START-UP

A. Replace or modify equipment, software, and materials that do not achieve design requirements after installation in order to attain compliance with the design requirements:

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1. Following replacement or modification, retest the system and perform additional testing to place the complete system in satisfactory operation and obtain compliance acceptance from the Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide similar items from a single manufacturer throughout the PCIS portion of the Project.

B. Allowable manufacturers are specified in individual instrument and equipment specifications in other sections of the Instrumentation and Control Specifications.

2.2 MATERIALS

A. Furnish all materials under this Contract that are new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these devices and that bear all approvals and labels as required by the Specifications.

B. Provide materials complying with the applicable industrial standard as specified in the Contract Documents.

2.3 SOURCE QUALITY CONTROL

A. Provide all equipment that is new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these products that bear all approvals and labels as required by the Specifications.

B. Arrange with all manufacturers of the equipment and fabricators of panels and cabinets, to allow the Owner and Engineer to inspect and witness the testing of the equipment at the site of fabrication:

1. Equipment includes the cabinets, special control systems, flow measuring devices, and other pertinent systems and devices.

C. Factory testing is specified in Division 26 and other sections of the Electrical, and the Instrumentation and Control Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The SI is encouraged to attend a pre-bid conference and examine the premises completely before bidding. It is the SI's responsibility to be fully familiar with the existing conditions and local requirements and regulations.

B. Review the existing Site conditions and examine all shop drawings for the various items of equipment in order to determine exact routing and final terminations for all wiring and cables.

C. Provide a complete instrumentation and control system:

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1. Install all extra conduits, cables, and interfaces as may be necessary to provide a complete and operating electrical, and process control and instrumentation system.

3.2 FIELD QUALITY CONTROL

A. Inspection:

1. Allow for inspection of PCIS installation.

2. Provide any assistance necessary to support inspection activities.

3. Engineer inspections may include, but are not limited to, the following:

a. Inspect equipment and materials for physical damage.

b. Inspect installation for compliance with Drawings and Specifications.

c. Inspect installation for obstructions and adequate clearances around equipment.

d. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.

e. Inspect equipment nameplate data to verify compliance with design requirements.

f. Inspect cable terminations.

g. Inspect/witness instrument calibrations/verifications.

4. Inspection activities conducted during construction do not satisfy inspection requirements specified in Division 26.

B. Instrument Installation Inspection:

1. Provide any assistance necessary to support inspection activities.

2. Inspections may include, but are not limited to, the following:

a. Inspect equipment and materials for physical damage.

b. Inspect the installed arrangement, lay lengths, orientation, piping obstructions etc. that could affect the instruments accuracy or repeatability.

c. Inspect installation for compliance with Drawings and Specifications.

d. Inspect installation for obstructions and adequate clearances around equipment.

e. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.

f. Inspect equipment nameplate data to verify compliance with design requirements.

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g. Inspect cable terminations.

h. Inspect/witness instrument calibrations/verifications.

3. Inspection activities conducted during construction do not satisfy inspection requirements specified in Division 26.

C. Field testing is specified in Division 26 and Section 01 75 16.

D. Installation supervision:

1. Ensure that the entire PCIS is installed in a proper and satisfactory manner. At a minimum, the contractor with assistance of the SI where applicable, shall provide the following services:

a. Installation resources:

1) Coordinate with the Contractor regarding installation requirements of the Contract Documents.

b. Provide technical assistance to installation personnel by telephone:

1) Furnish installation personnel with at least one copy of the approved submittals, including all installation details.

c. Periodic inspections during the construction period.

d. A complete check of the completed installation to ensure that it is in conformance with the requirements of the equipment manufacturer and the Contract Documents.

e. Field-verify accuracy and calibration of all instruments.

3.3 CLEANING

A. As specified in Section 01 77 00 – Project Closeout.

3.4 PROTECTION

A. Protect all Work from damage or degradation until date of Substantial Completion.

END OF SECTION 40 70 00

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LOCATION	INSTRUMENT TAG NO.	P&ID	REF. SHEET	DEVICE TYPE	PROCESS FLUID	SERVICE DESCRIPTION	PROCESS CONNECTION	SETPOINT / RANGE	POWER	CLASSIFICATION	SPECIFICATION	SCOPE	FURNISHED BY	INSTALLED BY	NOTES
CITY BEACH	LT-A100	EI-701-A	EI-101-A	RADAR LEVEL TRANSMITTER	N/A	WET WELL RADAR LEVEL TRANSMITTER	N/A	0 - 15 FT	LOOP	CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
CITY BEACH	LSH-A100	EI-701-A	EI-101-A	LEVEL SWITCH	SLUDGE	WET WELL HIGH LEVEL SWITCH	N/A	6.5 FT		CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
CITY BEACH	LSL-A100	EI-701-A	EI-101-A	LEVEL SWITCH	SLUDGE	WET WELL LOW LEVEL SWITCH	N/A	3 FT		CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
CITY BEACH	ME-A100	EI-701-A	EI-101-A	MOISTURE ELEMENT	N/A	PUMP A100 MOISTURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
CITY BEACH	TE-A100	EI-701-A	EI-101-A	TEMPERATURE ELEMENT	N/A	PUMP A100 TEMPERATURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
CITY BEACH	PI-A100	EI-701-A	EI-101-A	PRESSURE INDICATOR	N/A	PUMP A100 OUTLET PRESSURE GAUGE	1/2" MNPT	0-100 PSI		CLASS I DIV 2	40 73 00	NEW	CONTRACTOR	CONTRACTOR	ATTACHED TO ANNULAR SEAL
CITY BEACH	ME-A110	EI-701-A	EI-101-A	MOISTURE ELEMENT	N/A	PUMP A110 MOISTURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
CITY BEACH	TE-A110	EI-701-A	EI-101-A	TEMPERATURE ELEMENT	N/A	PUMP A110 TEMPERATURE ELEMENT	N//A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
CITY BEACH	PI-A110	EI-701-A	EI-101-A	PRESSURE INDICATOR	N/A	PUMP A110 OUTLET PRESSURE GAUGE	1/2" MNPT	0-100 PSI		CLASS I DIV 2	40 73 00	NEW	CONTRACTOR	CONTRACTOR	ATTACHED TO ANNULAR SEAL
CITY BEACH	FE-A100	EI-701-A	EI-101-A	MAGNETIC FLOW METER	SLUDGE	OUTLET MAGNETIC FLOW METER	6" CLASS 150 FLANGE	N/A		CLASS I DIV 2	40 70 13	NEW	CONTRACTOR	CONTRACTOR	
CITY BEACH	FIT-A100	EI-701-A	EI-101-A	FLOW INDICATING TRANSMITTER	N/A	OUTLET FLOW INDICATING TRANSMITTER	N/A	0-1000 GPM	120 VAC	CLASS I DIV 2	40 70 13	NEW	CONTRACTOR	CONTRACTOR	

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LOCATION	INSTRUMENT TAG NO.	P&ID	REF. SHEET	DEVICE TYPE	PROCESS FLUID	SERVICE DESCRIPTION	PROCESS CONNECTION	SETPOINT / RANGE	POWER	CLASSIFICATION	SPECIFICATION	SCOPE	FURNISHED BY	INSTALLED BY	NOTES
SUPERIOR STREET	LT-B100	EI-701-B	EI-101-B	RADAR LEVEL TRANSMITTER	N/A	WET WELL RADAR LEVEL TRANSMITTER	N/A	0 - 16.5 FT	LOOP	CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
SUPERIOR STREET	LSH-B100	EI-701-B	EI-101-B	LEVEL SWITCH	SLUDGE	WET WELL HIGH LEVEL SWITCH	N/A	8.25 FT		CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
SUPERIOR STREET	LSL-B100	EI-701-B	EI-101-B	LEVEL SWITCH	SLUDGE	WET WELL LOW LEVEL SWITCH	N/A	4.25 FT		CLASS I DIV 1	40 72 00	NEW	CONTRACTOR	CONTRACTOR	
SUPERIOR STREET	ME-B100	EI-701-B	EI-101-B	MOISTURE ELEMENT	N/A	PUMP B100 MOISTURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
SUPERIOR STREET	TE-B100	EI-701-B	EI-101-B	TEMPERATURE ELEMENT	N/A	PUMP B100 TEMPERATURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
SUPERIOR STREET	PI-B100	EI-701-B	EI-101-B	PRESSURE INDICATOR	N/A	PUMP B100 OUTLET PRESSURE GAUGE	1/2" MNPT	0-100 PSI		CLASS I DIV 2	40 73 00	NEW	CONTRACTOR	CONTRACTOR	ATTACHED TO ANNULAR SEAL
SUPERIOR STREET	ME-B110	EI-701-B	EI-101-B	MOISTURE ELEMENT	N/A	PUMP B110 MOISTURE ELEMENT	N/A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
SUPERIOR STREET	TE-B110	EI-701-B	EI-101-B	TEMPERATURE ELEMENT	N/A	PUMP B110 TEMPERATURE ELEMENT	N//A	N/A		CLASS I DIV 1		NEW	MANUFACTURER	CONTRACTOR	
SUPERIOR STREET	PI-B110	EI-701-B	EI-101-B	PRESSURE INDICATOR	N/A	PUMP B110 OUTLET PRESSURE GAUGE	1/2" MNPT	0-100 PSI		CLASS I DIV 2	40 73 00	NEW	CONTRACTOR	CONTRACTOR	ATTACHED TO ANNULAR SEAL
SUPERIOR STREET	FE-B100	EI-701-B	EI-101-B	MAGNETIC FLOW METER	SLUDGE	OUTLET MAGNETIC FLOW METER	6" CLASS 150 FLANGE	N/A		CLASS I DIV 2	40 70 13	NEW	CONTRACTOR	CONTRACTOR	
SUPERIOR STREET	FIT-B100	EI-701-B	EI-101-B	FLOW INDICATING TRANSMITTER	N/A	OUTLET FLOW INDICATING TRANSMITTER	N/A	0-1000 GPM	120 VAC	CLASS I DIV 2	40 70 13	NEW	CONTRACTOR	CONTRACTOR	

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SECTION 40 70 00.1 – INSTRUMENTATION AND CONTROL, REFERENCES AND DEFINITIONS

1.1 REFERENCES

A. Code compliance:

1. As specified in Section 01375 - Standard References:

a. The publications are referred to in the text by basic designation only. The latest edition accepted by the Authority Having Jurisdiction of referenced publications in effect at the time of Bid governs.

2. The following codes and standards are hereby incorporated into this Section:

a. American National Standards Institute (ANSI).

b. International Organization for Standardization (ISO):

1) 9001 - Quality Management Systems - Requirements.

c. International Society of Automation (ISA):

1) 5.1 - Instrumentation Symbols and Identification.

2) 5.4 - Instrument Loop Diagrams.

3) 20 - Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.

d. National Electrical Manufacturers Association (NEMA):

1) 250 - Enclosures for Electrical Equipment (1000 V Maximum).

e. National Fire Protection Association (NFPA).

f. National Institute of Standards and Technology (NIST).

g. Underwriters Laboratories, Inc. (UL):

1) 508 - Standard of Safety for Industrial Control Equipment.

2) 508A - Standard of Safety for Industrial Control Panels.

B. Compliance with Laws and Regulations:

1. As specified in Section C-700 – General Conditions.

1.2 DEFINITIONS

A. Definitions of terms and other electrical and instrumentation considerations in accordance with:

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1. Factory Mutual (FM).
2. International Electrotechnical Commission (IEC).
3. Institute of Electrical and Electronics Engineers (IEEE).
4. International Society of Automation (ISA).
5. International Organization for Standardization (ISO).
6. National Electrical Code (NEC).
7. National Electrical Manufacturers Association (NEMA).
8. InterNational Electrical Testing Association (NETA).
9. National Fire Protection Association (NFPA).
10. National Institute of Standards and Technology (NIST).
11. Underwriters Laboratories (UL).

B. Specific definitions:

1. Control circuit: Any circuit operating at 120 volts alternating current (VAC) or direct current (VDC) or less, whose principal purpose is the conveyance of information (including performing logic) and not the conveyance of energy for the operation of an electrically powered device.
2. Panel: An instrument support system that may be a flat surface, a partial enclosure, or a complete enclosure for instruments and other devices used in process control systems. Unless otherwise specified or clearly indicated by the context, the term “panel” in these Contract Documents is interpreted as a general term, which includes flat surfaces, enclosures, cabinets and consoles.
3. Power circuit: Any circuit operating at 90 volts (AC or DC) or more, whose principal purpose is the conveyance of energy for the operation of an electrically powered device.
4. Signal circuit: Any circuit operating at less than 50 VAC or VDC, which conveys analog information or digital communications information.
5. Digital bus: A communication network, such as PROFIBUS, Foundation Fieldbus, or DeviceNet, allowing instruments and devices to transmit data, control functions and diagnostic information.
6. 2-Wire transmitter (loop powered): A transmitter that derives its operating power supply from the signal transmission circuit and requires no separate power supply connections. As used in this Section, two-wire transmitter refers to a transmitter that provides 4 to 20 milliamperes current regulation of a signal in a series circuit with an external 24 VDC driving potential.

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7. Powered transmitters: A transmitter that requires a separate power source (120 VAC, 240 VAC, etc.) in order for the transmitter to develop its signal. As used in this Section, the produced signal may be a 4 to 20 milliampere current signal, a digital bus communications signal or both.

8. System supplier - As specified in SI Qualifications in the Quality Assurance article of this Section.

9. Modifications: Changing, extending, interfacing to, removing or altering an existing circuit.

C. NEMA:

1. Type 1 enclosure in accordance with NEMA 250.

2. Type 2 enclosure in accordance with NEMA 250.

3. Type 3 enclosure in accordance with NEMA 250.

4. Type 3R enclosure in accordance with NEMA 250.

5. Type 3S enclosure in accordance with NEMA 250.

6. Type 3X enclosure in accordance with NEMA 250.

7. Type 3RX enclosure in accordance with NEMA 250.

8. Type 3SX enclosure in accordance with NEMA 250.

9. Type 4 enclosure in accordance with NEMA 250.

10. Type 4X enclosure in accordance with NEMA 250.

11. Type 5 enclosure in accordance with NEMA 250.

12. Type 6 enclosure in accordance with NEMA 250.

13. Type 6P enclosure in accordance with NEMA 250.

14. Type 12 enclosure in accordance with NEMA 250.

15. Type 12K enclosure in accordance with NEMA 250.

16. Type 13 enclosure in accordance with NEMA 250.

D. Acronym definitions:

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1. CCS: The SCADA central computer system (CCS) consisting of personal computers and software. The personal computer-based hardware and software system that includes the operator interface, data storage, data retrieval, archiving, alarming, historian, reports, trending, and other higher level control system software and functions.

2. DPDT: Double-pole, double-throw.

3. ES: Enterprise system: Computer based communications or data sharing system utilized for non-process control functions such as E-mail, sharing files, creating documents, etc.

4. FAT: Factory acceptance test.

5. HART: Highway addressable remote transducer.

6. HOA: Hand-Off-Auto control function that is totally PLC based. In the Hand mode, equipment is started or stopped, valves are opened or closed through operator direction under the control of the PLC software. In the Auto mode, equipment is started or stopped and valves are opened or closed through a control algorithm within the PLC software. In the Off mode, the equipment is prohibited from responding from the PLC control.

7. HMI: Human machine interface: PLC based operator interface device consisting of an alphanumeric or graphic display with operator input functionality. The HMI is typically a flat panel type of display mounted on the front of a PLC enclosure with either a touch screen or tactile button interface.

8. IJB: Instrument junction boxes: A panel designed with cord sets to easily remove, replace or relocate instrument signals.

9. I/O: Input/Output.

10. IP: Internet protocol or ingress protection.

11. LCP: Local control panel: Operator interface panel that may contain an HMI, pilot type control devices, operator interface devices, control relays, etc. and does not contain a PLC or RIO.

12. LAN: Local area network: A control or communications network that is limited to the physical boundaries of the facility.

13. LOR: Local-Off-Remote control function. In the Remote mode, equipment is started or stopped, and valves are opened or closed through the PLC based upon the selection of the HOA. In the Local mode, equipment is started or stopped, valves are opened or closed based upon hardwired control circuits completely independent of the PLC with minimum interlocks and permissive conditions. In the Off mode, the equipment is prohibited from responding to any control commands.

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14. NJB: Network junction box. An enclosure that contains multiple access points to various networks within the facility. Networks could be Ethernet, Ethernet/IP, Fieldbus, RIO etc.

15. OIT: Operator interface terminal: PC-based interface device used for operator interface with the SCADA system.

16. P&ID: Process and instrumentation diagram.

17. PC: Personal computer.

18. PCIS: Process control and instrumentation system: Includes the entire instrumentation system, the entire control system, and all of the Work specified in the Instrumentation and Control Specifications and depicted on the Instrumentation Drawings.

19. PCM: Process control module: An enclosure containing any of the following devices: PLC, RTU, or RIO.

20. PJB: Power junction box: An enclosure with terminal blocks that distribute power to multiple instruments.

21. PLC: Programmable logic controller.

22. RIO: Remote I/O device for the PLC consisting of remote I/O racks, or remote I/O blocks.

23. RTU: Remote telemetry unit: A controller typically consisting of a PLC, and a means for remote communications. The remote communications devices typically are radios, modems, etc.

24. SCADA: Supervisory control and data acquisition system: A general name for the computerized system that gathers and processes data from sensors and applies operational controls to the process equipment. It includes the PLCs and/or RTUs, HMI PLC-based operator interface units, related interconnecting communications systems, and the CCS operator interface and data management system.

25. SI: System Integrator: Subcontractor who specializes in the design, construction, fabrication, software development, installation, testing, and commissioning of industrial instrumentation and control systems.

26. SPDT: Single-pole, double-throw.

27. SPST: Single-pole, single-throw.

28. UPS: Uninterruptible power supply.

29. VCP: Vendor control panel: Control panels that are furnished with particular equipment by a vendor other than the SI. These panels may contain PLCs, RIO, OIT, HMI, etc.

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30. WAN: Wide area network: A control or communications network that extends beyond the physical boundaries of the facility.

END OF SECTION 40 70 00.1

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SECTION 40 70 00.2 – INSTRUMENTATION AND CONTROL, SYSTEM DESCRIPTION

1.1 SYSTEM DESCRIPTION

A. System Integrator (SI) shall be B&E Electric, Liberty Lake, WA.

B. Scope of work.

1. System Integrator shall provide local control panels and motor control panels in accordance with G-006 Responsibility Matrix and the contract between the Owner and Integrator. System Integrator shall specify and furnish all components for a complete install of the local control panels and motor control panels. Contractor shall be responsible for physical installation of the local control panels and motor control panels (i.e., mounting and wiring).

2. SCADA Hardware/Software. System Integrator shall provide any required SCADA server equipment as outlined in the contract between the System Integrator and Owner.

3. PCIS PLCs – System Integrator to specify and furnish PLCs.

4. Instrumentation. Contractor to provide and install control system instrumentation as described in the drawings and specifications. Refer to 40 70 00 A – Instrument List for complete list of instrumentation.

5. Control Panels. System Integrator to provide control panels as described in the drawings and specifications. Refer to 40 67 00 – Control Panels

6. Contractor to provide conduit and cable for associated instrumentation and control as described in the drawings and specifications. Refer to cable schedules in drawings

7. Programming/Startup/Commissioning/Training. System Integrator shall provide complete system installation, programming, commissioning, and training as described in these drawings and specifications and as necessary to provide a complete and functional instrumentation and control system.

C. Control system installation and startup constraints:

1. Every effort shall be made to minimize downtime and maintain SCADA access to existing PLC hardware during construction and startup.

2. All PCIS and network outages shall be scheduled and pre-approved by the Engineer. The Contractor shall submit a PCIS and network cutover plan to the Engineer for approval.

D. General requirements:

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1. The Work includes everything necessary for and incidental to executing and completing the Instrumentation and Control System Work indicated on the Drawings and specified in the Specifications and reasonably inferable there from including but not limited to:

    a. Preparing hardware submittals for field instrumentation.

    b. Design, develop, and draft control panel designs and all other drawing submittals specified in the Instrumentation and Control Specifications.

    c. Prepare the test plan, the training plan, and the spare parts submittals.

    d. Provide all SCADA system hardware and software as indicated in documentation.

    e. Fabricate panels.

    f. Perform factory tests on panels.

    g. Perform bench calibration and verify calibration after installation.

    h. Oversee and certify installation of the PCIS.

    i. Oversee, document, and certify loop testing.

    j. Oversee, document, and certify system pre-commissioning.

    k. Conduct the performance tests.

    l. Prepare operation and maintenance manuals.

    m. Conduct training classes.

    n. Integrate the PCIS with instrumentation and control devices provided under other sections.

    o. Prepare Record Drawings.

        1) Develop all Record Drawings associated with instruments and equipment provided under the scope of this contract.

        2) Contract Documents and all Owner furnished and any existing equipment the system is interfacing.

    p. Resolve signal, power, or functional incompatibilities between the PCIS and interfacing devices.

    q. Perform all required corrective and preventative maintenance.

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2. Coordinate all aspects of the Work between Contractor and all subcontractors before bidding to ensure that all costs associated with a complete installation are included. The Owner is not responsible for any change orders due to lack of coordination of the Work between the Contractor, the System Integrator, the other subcontractors or suppliers.

3. Furnish detailed, complete, and thorough operations and maintenance documentation, including but not limited to operations manuals, maintenance manuals, as-built wiring drawings, training manuals, as-built software documentation, and all other documentation required to operate, modify, and maintain all parts of the PCIS.

4. Portions of this Project involve installation in existing facilities and interfaces to existing circuits, power systems, controls, and equipment. Perform and document detailed field investigations of existing conditions (circuits, power systems, controls, equipment, etc.) before performing any Work.

5. Defective Work:

    a. As specified in Section C-700 – General Conditions.

END OF SECTION 40 70 00.2

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SECTION 40 70 13 – FLOW MEASURING AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide in-line liquid flow measuring systems, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A. COMMERCIAL STANDARDS:

1.	ANSI – B16.5	Pipe Flanges and Flanged Fittings.
2.	ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service – Sizes 4” through 144”.
3.	ANSI/AWWA C701-12	Cold Water Meters.
4.	ASME Report	Fluid Meters, Sixth Edition, 1971.
5.	NSF/ANSI 61	Drinking Water System Components.
6.	ISO 17025	General Requirements for the Competence of Testing and Calibration Laboratories.
7.	ISO 9001	Quality Management System.

1.3 SUBMITTALS

A. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer’s Certifications, Manufacturer’s Field Reports

B. Product Data:

1. Dimensional Drawings.
2. Materials of Construction:
    a. Metering Tube.
    b. Liner.
    c. Flanges.

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d. Meter Specific Devices (i.e. electrodes, turbines, thermostats, pressure plates)

3. Measurement Accuracy.

4. Range and Rangeability.

5. Enclosure Rating.

6. Area Classification Rating.

7. Power:

a. Voltage.

b. Wattage.

8. Specified Output Options.

1.4 QUALITY ASSURANCE

A. Manufacture instruments facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

B. Flow meters shall be factory calibrated using an ISO 17025 accredited test with certified accuracy traceable to NIST.

C. Warranty: All flow metering systems shall be provided with manufacturer's standard one-year warranty.

D. The flow metering system shall permit a traceable and attested method of metrological verification. The verification will permit long term analysis of the transmitter linearity, repeatability and sensor stability and prediction of device out of specification. The verification must be by a method which follows ISO 9001 Section 7.6.a.

PART 2 - PRODUCTS

2.1 GENERAL

A. Meters and transmitters shall have electronics housings with a minimum rating of NEMA 4X (IP 67/68) and be constructed of materials compatible with process environment in polycarbonate, epoxy-coated aluminum, or 316/316L SS.

B. All flow measuring and detection systems, both sensors and transmitters, shall be capable of operating within an ambient temperature range of -10 °F to 120 °F unless stated otherwise in the Design Documentation.

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C. All wetted materials shall be compatible with process medium as shown in Specification 40 70 00 – Instrumentation List.

D. All meters shall be capable of operating over the process medium flow rate range as defined in the Design Documentation. All meters shall be compatible with process pressure ranges as defined in Design Documentation.

E. All flow measuring and detection systems shall be rated for hazardous areas requirements as defined by NFPA and identified in the Design Documentation. See Design Documentation for further information. Contractor shall be responsible for all methods of installation conforming to NFPA requirements.

F. The Contractor shall be responsible for specifying all interconnecting cable lengths with the Manufacturer per Design Documentation. See Design Documentation for further information.

G. The meter body shall follow ISO fitting lengths and be supplied with flanged/NPT process connections per Design Documentation in accordance with ANSI B16.5.

H. Meters must operate in a completely filled line at all times. The downstream piping must always provide sufficient back pressure to maintain a full line at the meter.

2.2 TRANSMITTER

A. The transmitter shall be suitable for installation outdoors, subject to direct sunlight, and full temperature range at the installed location.

B. The transmitter shall have a menu guided HMI structure for straightforward commissioning in the field and connections to all transmitter power supplies and PLC signaling as shown in Specification 40 70 00 – Instrumentation List.

C. The transmitter shall retain all setup parameters and accumulated measurements internally in non-volatile memory in the event of power failure.

D. The transmitter and sensor shall include a method to verify flow meter performance to the original manufacturer specifications.

E. The transmitter shall communicate with the PLC using communication method and output signal type per the Design Documentation.

F. The transmitter shall have a display for flow rate, percent of span, and totalization.

2.3 ELECTROMAGNETIC FLOW METER

A. The sensor body shall have a nominal diameter per Design Documentation.

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B. The sensor shall include a minimum of two (2) self-cleaning electrodes.

C. The sensor wetted components shall be constructed of materials compatible with process medium in either 316/316L SS, Alloy-C22, tantalum, or platinum.

D. The sensor shall include compatible liner materials suitable for the intended application in either PTFE, PFA, or ceramic.

E. Grounding rings shall conform to the Manufacturer's bore and material recommendation for the intended service. Grounding rings shall be designed to protect and shield the liner's edge interface from abrasion at the meter end.

F. Grounding rings shall be installed and connected as recommended by the Manufacturer, especially concerning process mediums involving corrosive or electrolytic materials.

G. Meters shall have a maximum measurement error no greater than ± 0.5% of the volume flow.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electromagnetic flow meters which may be incorporated include the following:

1. Endress + Hauser

    a. Proline Promag

2. Emerson/Rosemount

    a. Rosemount 8705

3. Yokogawa

    a. ADMAG AXW

4. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide flow meters and switches as indicated in specification 40 70 00 A – Instrumentation List.

3.2 INSTALLATION

A. Install as shown on Installation Details and per Mechanical Drawings.

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B. As recommended by the Manufacturer's Installation and Operation Manual.

C. Wiring between flow sensors and remote mounted signal converters shall use cable type and procedures per the manufacturer recommendations. Provide sufficient cable from meter location to the location of the local display. Confirm cable lengths prior to submitting Shop Drawings.

D. For flanged connections, verify bolts and gaskets are compatible with the flange pressure rating. Verify gasket material is compatible with process medium.

E. Straight run requirements may vary depending on the type of obstruction both upstream and downstream of the flow meter/switch. Verify straight run requirements in Manufacturer Installation Manual are met.

F. Verify run requirements per install location and conditions.

G. Provide all required accessories for installation and install per Manufacturer's recommendations, including but not limited to instrument tagging, mounting brackets, gaskets, and associated hardware.

H. All instruments shall be fully protected after installation and before commissioning. Replace any instruments subject to damage in accordance with Engineer approved corrective measures.

I. ELECTROMAGNETIC FLOW METER

1. Specific attention should be given to the following technical requirements:

a. Verify grounding rings have been installed according to the manufacturer's recommendations.

b. Reduced inlet installations must be accompanied by manufacturer's documented evidence of third-party testing and data collection in comparison to a traceable standard.

c. Unless otherwise specified in manufacturer manual or Design Documentation, sensors shall meet straight run requirements of 5D upstream and 2D downstream.

d. Negative pressure in the measuring pipe can damage the liner. Install the sensor in the flow direction downstream from pumps and downstream of down pipes where possible.

e. Do not install the sensor at the highest point of the pipe to prevent air entrapment.

f. Do not expose the sensor to strong vibrations.

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3.3 DELIVERY, STORAGE, AND HANDLING

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the Manufacturer.

B. Any instruments that are not stored in strict conformance with the Manufacturer's recommendation shall be replaced.

3.4 TESTING

A. Each device shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required.

B. Each device shall be subjected to an operating test over the total measurement range of the instrument.

C. The Contractor shall provide documented evidence of pressure testing following installation.

D. Isolate and protect instruments where in-situ testing is outside of instrument allowable range which may cause damage to the device.

3.5 CLEANUP

A. After completion of installation and testing of device operation, the Contractor shall remove all debris from the site, clean all meters, cabinets, and appurtenance. The Contractor shall submit each system to the Owner in final operating condition.

B. Provide to Owner all associated documentation including manuals, completed data sheets, configuration settings, certificates of calibration, etc.

END OF SECTION 40 70 13

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SECTION 40 72 00 - LEVEL MEASURING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide level sensing equipment, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A. COMMERCIAL STANDARDS:

1.	ANSI – B16.5	Pipe Flanges and Flanged Fittings.
2.	NSF/ANSI 61	Drinking Water System Components.
3.	ANSI – B16.5	Pipe Flanges and Flanged Fittings.
4.	ISO 17025	General Requirements for the Competence of Testing and Calibration Laboratories
5.	ISO 9001	Quality Management System.

1.3 SUBMITTALS

A. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer's Certifications, Manufacturer's Field Reports.

B. Product Data:

1. Dimensional Drawings.
2. Materials of Construction:
    a. Sensor.
    b. Wetted O-Rings.
    c. Flanges / Process connection.
    d. Housings.
3. Measurement Accuracy.
4. Range and Rangeability.

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5. Enclosure Rating.

6. Classification Rating.

7. Power:

   a. Voltage.

   b. Wattage.

8. Specified Output Options.

1.4 QUALITY ASSURANCE

A. Manufacture instruments facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

B. Level elements and transmitters shall be factory calibrated using an ISO 17025 accredited test with certified accuracy traceable to NIST. Transmitters shall be shipped to the factory site factory-calibrated and accompanied with certificate of such.

C. Warranty: All level measuring and detection systems shall be provided with manufacturer's standard one-year warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. All sensors and transmitters shall be capable of operating within an ambient temperature range of -10 °F to 120 °F unless stated otherwise in the Design Documentation.

B. All wetted materials shall be compatible with process medium per Design Documentation.

C. Materials in contact with potable water shall be listed as compliant with NSF/ANSI 61.

D. All sensors and transmitters shall be capable of operating over the process level range as defined in Specification 40 70 00 – Instrumentation List. All sensors and transmitters shall be compatible with process pressure ranges as defined in Design Documentation.

E. All sensors and transmitters shall meet hazardous areas requirements as defined by NFPA and identified in the Drawings. See Drawings for further information.

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Contractor shall be responsible for all methods of installation conforming to NFPA requirements.

F. Sensors and transmitters shall have electronics housings with a minimum rating of NEMA 4X (IP 67/68) and be constructed of materials compatible with process environment in polycarbonate, epoxy-coated aluminum, or 316/316L SS.

G. The Contractor shall be responsible for specifying all interconnecting cable lengths with the Manufacturer per Design Documentation. See Design Documentation for further information.

2.2 TRANSMITTERS

A. The transmitter shall be suitable for installation outdoors, subject to direct sunlight and full temperature range at the installed location.

B. The transmitter housing shall be constructed of material compatible with application environment in plastic, die cast aluminum with a powder epoxy coating, or 316L SS. The transmitter shall have housing with a minimum rating of NEMA 4X / IP 66.

C. The transmitter shall have a menu guided HMI structure for straightforward commissioning in the field and connections to all transmitter power supplies and signals as shown in the Design Documentation.

D. The transmitter shall retain all setup parameters and accumulated measurements internally in non-volatile memory in the event of power failure.

E. The transmitter shall communicate with the PLC using communication method and output signal type per the Design Documentation.

F. The transmitter shall have a process connection as outlined in the Design Documentation.

G. The transmitter shall have a display for measurements of level and volume.

2.3 RADAR (NON-CONTACTING)

A. The instrument shall be supplied with flanged/NPT process connections per Design Documentation in accordance with ANSI B16.5.

B. The probe shall be constructed of material compatible with process medium in either 316L stainless steel, Hastelloy, PTFE, PVDF, or ceramic.

C. The instrument shall be capable of handling process pressures between -14.5 psi to 43 psi.

D. The instrument shall have a maximum error of ± 2 mm on measuring ranges less than 49 feet.

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E. The instrument shall not be affected by changing media, changing temperatures, gas blankets or vapors.

F. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering non contacting radar level sensors which may be incorporated include the following:

1. Endress + Hauser

a. Micropilot FMR20-CBPBNVCEXR03+R3

2.4 LEVEL SWITCH (FLOAT)

A. Float type level switches shall be mercury-free self counter-weighted, SPDT.

B. Float type level switches shall be intrinsically safe with a zener barrier between the switch contacts and the power source.

C. Cable hangers shall be constructed of material compatible with process medium in either stainless steel, PVC, or ABS.

D. Float type level switches shall be supplied with adequate cable length to reach the barrier location without splicing the cable.

E. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering float type level switches which may be incorporated include the following:

1. Endress + Hauser

a. Liquifloat FTS20

2. SJE Rhombus

3. Dwyer

a. Series FSW2

4. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide level transmitters and switches as indicated in specification 40 70 00 A – Instrumentation List.

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3.2 INSTALLATION

A. Install as shown on Installation Details and Mechanical Drawings.

B. As recommended by the Manufacturer's Installation and Operation Manual.

C. Wiring between level sensors and remote mounted signal converters shall use cable type and procedures per the manufacturer recommendations. Provide sufficient cable from meter location to the location of the local display. Confirm cable lengths prior to submitting Shop Drawings.

D. RADAR (NON-CONTACTING)

1. Specific attention should be given to the following technical requirements:

a. Align the antenna vertically to the product surface.

b. Recommended distance from wall to outer edge of nozzle is 1/6 of the tank diameter.

c. Do not install in the center of the tank as interference can cause signal loss.

d. Do not install over the fill stream.

e. Avoid any instrument installations inside the signal beam. Take into account the beam angle.

3.3 DELIVERY, STORAGE, AND HANDLING

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the Manufacturer.

B. Any instruments that are not stored in strict conformance with the Manufacturer's recommendation shall be replaced.

3.4 TESTING

A. Each device shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required.

B. Each device shall be subjected to an operating test over the total measurement range of the instrument.

C. The Contractor shall provide documented evidence of pressure testing following installation.

D. Isolate and protect instruments where in-situ testing is outside of instrument allowable range which may cause damage to the device.

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3.5 CLEANUP

A. After completion of installation and testing of device operation, the Contractor shall remove all debris from the site, clean all meters, cabinets, and appurtenance. The Contractor shall submit each system to the Owner in final operating condition.

B. Provide to Owner all associated documentation including manuals, completed data sheets, configuration settings, certificates of calibration, etc.

END OF SECTION 40 72 00

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SECTION 40 73 00 - PRESSURE MEASURING AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide pressure measuring systems, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

A. COMMERCIAL STANDARDS:

1.	ANSI – B16.5	Pipe Flanges and Flanged Fittings.
2.	NSF/ANSI 61	Drinking Water System Components.
3.	ANSI – B16.5	Pipe Flanges and Flanged Fittings.
4.	ISO 17025	General Requirements for the Competence of Testing and Calibration Laboratories.
5.	ISO 9001	Quality Management System.

1.3 SUBMITTALS

A. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer’s Certifications, Manufacturer’s Field Reports.

B. Product Data:

1. Dimensional Drawings.
2. Materials of Construction:
    a. Gauge.
    b. Seals (i.e., diaphragm, annular).
    c. Flanges / Process Connections.
    d. Accessory devices (i.e., snubber adapter, pigtail siphon, isolation valve, etc.).
    e. Housings.
3. Measurement Accuracy.
4. Range and Rangeability.

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5. Enclosure Rating.

6. Area Classification Rating.

7. Power:

   a. Voltage.

   b. Wattage.

8. Specified Output Options.

1.4 QUALITY ASSURANCE

A. Manufacture instruments facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

B. Pressure gauges and transmitters shall be factory calibrated using an ISO 17025 accredited test with certified accuracy traceable to NIST. Transmitters shall be shipped to the factory site factory-calibrated and accompanied with certificate of such.

C. Warranty: All pressure measuring and detection systems shall be provided with manufacturer's standard one-year warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. All sensors and transmitters shall be capable of operating within an ambient temperature range of -10 °F to 120 °F unless otherwise specified in the Design Documentation.

B. All wetted materials shall be compatible with process medium per Design Documentation.

C. Materials in contact with potable water shall be listed as compliant with NSF/ANSI 61-12. Liquid-filled gauges and seals for potable water service shall be filled with an NSF 61 approved liquid.

D. All sensors and transmitters shall be capable of operating over the process medium pressure range as defined in the Design Documentation.

E. All sensors and transmitters shall be meet hazardous areas as defined by NFPA and identified in the Design Documentation. See Design Documentation for further information. Contractor shall be responsible for all methods of installation and conforming to NFPA requirements.

F. Sensors and transmitters shall have electronics housings with a minimum rating of NEMA 4X (IP 67/68) and be constructed of materials compatible with process environment in polycarbonate, epoxy-coated aluminum, or 316/316L SS.

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G. The Contractor shall be responsible for specifying all interconnecting cable lengths with the manufacturer per Design Documentation. See Design Documentation for further information.

H. The maximum overrange pressure limit for all pressure measuring systems shall be a minimum of 150% of the range.

I. Gauges and pressure sensing devices shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices as specified and shown in the Design Documentation.

2.2 TRANSMITTERS

A. The transmitter shall be suitable for installation outdoors, subject to direct sunlight, and full temperature range at the installed location.

B. The transmitter housing shall be constructed of material compatible with application environment in plastic, die cast aluminum with a powder epoxy coating, or 316L SS. The transmitter shall have housing with a minimum rating of NEMA 4X / IP 66.

C. The transmitter shall have a menu guided HMI structure for straightforward commissioning in the field and connections to all transmitter power supplies and signals as shown in the Design Documentation.

D. The transmitter shall retain all setup parameters and accumulated measurements internally in non-volatile memory in the event of power failure.

E. The transmitter shall communicate with the PLC using communication method and output signal type per the Design Documentation.

F. The transmitter shall have a process connection as outlined in the Design Documentation.

G. The transmitter accuracy, including linearity and repeatability, shall be ± 2% of the measurement span.

H. The transmitter shall have a minimum static pressure limit of 1.5 times the nominal pressure range. The minimum burst pressure limit of pressure transmitters shall be 10X of this range.

I. The Contractor shall be responsible for specifying all interconnecting cable lengths with the Manufacturer per Design Documentation. See Design Documentation for further information.

J. Differential pressure transmitters used for flow service shall include square root extraction to produce an output signal linearly proportional to flow.

K. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure transmitters which may be incorporated include the following:

1. With local indicator and controller:

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a. Endress + Hauser

1) PMP51

2) PMP71

b. Rosemount

1) 2088

2) 3051

c. Yokogawa

1) EJA

2) EJX

d. Or approved equal.

2. Without local indicator and controller:

a. Endress + Hauser

1) PMP21

b. Ashcroft

1) G2

c. WIKA

1) S-20

d. Or approved equal.

3. Differential Pressure

a. Endress + Hauser

1) PMP51

2) PMP71

b. Rosemount

1) 2088

2) 3051

c. Yokogawa

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1) EJA

2) EJX

d. Vega

a. VEGADIF 85

e. Or approved equal.

2.3 PRESSURE AND VACUUM GAUGES

A. Gauges, including bourdon tube, shall be constructed of material compatible with process medium in either 304 SS or 316/316L SS. Gauge housing shall be constructed of material compatible with installation location in either 304/316L SS or PBT.

B. Gauges shall have a 4 ½ in. dial with a ½ in. NPT connection unless otherwise shown or specified in the design documentation.

C. Gauges shall be calibrated to read in applicable units, with an accuracy of ± 0.5% of the measuring span, up to 150% of the working pressure or vacuum of the pipe or vessel to which they are connected.

D. All gauges shall read in psi.

E. All gauges shall be vibration and shock resistant.

F. Gauges shall have a snubber when the process medium has a potential for large fluctuations in pressure.

G. Gauges shall have an isolation valve when a diaphragm seal or annular seal is not used in-line with pressure gauges.

H. Snubbers and isolation valves shall be constructed of materials that are compatible with the process medium in either 316/316L SS, Hastelloy, or Monel.

I. Gauges shall have a pigtail siphon when a process medium is a high temperature gas (temperature higher than the pressure gauge is rated for).

1. Pigtail siphons shall not be used when a diaphragm seal or annular seal is used.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure or vacuum gauges which may be incorporated include the following:

1. BOURDON TUBE PRESSURE GAUGE

a. Ashcroft

a. 1259

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b. WIKA

a. 232.24

c. Noshok

a. 740

d. Or approved equal.

2. BOURDON TUBE PRESSURE GAUGE, LIQUID-FILLED

a. Ashcroft

a. 1279

b. WIKA

a. 233.34

c. Noshok

a. 760

d. Or approved equal.

K. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauges accessories which may be incorporated include the following:

1. SNUBBERS

a. Ashcroft

1) 1112

2) 1116

b. WIKA

1) 910.12

c. Noshok

1) 1325

2) 1350

d. Or approved equal.

2. PIGTAIL SIPHONS

a. Ashcroft

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1) 1098

2) 1100

b. WIKA

1) 910.15

c. Noshok

1) 1025

2) 1050

d. Or approved equal

2.4 DIAPHRAGM SEALS

A. Diaphragm seals shall be provided as shown in Design Documentation for all gauges, pressure transmitters, or pressure switches where fluid has medium solids, contains chemicals, is of a corrosive nature, or high temperature which could affect the accuracy of the pressure sensing device.

B. Diaphragm seals shall consist of a bottom housing, lower ring, diaphragm capsule, fill screw, flushing connection, and top housing.

1. The diaphragm seal shall have a removable bottom housing to permit servicing.

2. The diaphragm seal shall be factory assembled to the corresponding pressure instrument and be factory-filled. The assembly shall be shipped with a tag reading "Do not disassemble for installation”.

3. Housing exposed surfaces shall be constructed of 316/316L SS, Hastelloy, or Monel for pressure service over 15 psi.

C. Diaphragm seals shall be constructed of materials compatible with process medium and pressures per Design Documentation.

1. Seals shall be 304 SS, 316/316L SS, Hastelloy, or Monel for pressures over 15 psi.

2. Seals shall be elastomer for pressures less than or equal to 15 psi.

D. Diaphragm seal nuts and bolts shall be constructed in 316/316L SS.

E. Fill connections and valved flush ports shall utilize ¼ inch NPT capable of disassembly without loss of filler fluid.

F. Diaphragm seal fill fluid shall be compatible with process medium and process temperature range as defined in Design Data and as required by NSF 61.

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G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering diaphragm seals which may be incorporated include the following:

1. Ashcroft
    a. Series 100
    b. Series 101
    c. Series 200
    d. Series 201
2. WIKA
    a. 990.10
    b. 990.34
3. Noshok
    a. Type 10
4. Or approved equal.

2.5 ANNULAR SEALS

A. Annular seals shall be provided as shown in Design Documentation for all gauges, pressure transmitters, or pressure switches where fluid has large solids or is of a highly viscous composition.

B. Annular seals shall consist of a bolt-through isolation ring and 304 SS or 316/316L SS calibration/evacuation accessory.

C. The isolation ring body shall follow ISO fitting lengths and be supplied with wafer process connections per Design Documentation in accordance with ANSI B16.5.

D. Any required instrument manifolds and connections shall be 316/316L SS, minimum size of ½ in. with NPT connection compatible with pressure sensing device. Pressure transmitters, switches, and gauges shall be shipped complete with annular seal from manufacturer following factory assembly, evacuation, and calibration.

E. Isolation ring shall include a valve and/or quick release device to allow instruments to be removed while the piping is in service and to prevent loss of fill fluid.

F. Isolation ring seal shall be constructed of materials compatible with process medium in PTFE or EPDM.

G. Annular seal fill fluid shall be compatible with process medium and process temperature range as defined in Design Data and as required by NSF 61.

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H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering annular seals which may be incorporated include the following:

1. Ashcroft
    a. Series 80
    b. Series 81
2. WIKA
    a. 981.10
3. Noshok
    a. Type 40
4. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide pressure and vacuum transmitters, gauges, diaphragm seals, annular seals, and pressure switches as indicated in specification 40 70 00 A – Instrumentation List.

3.2 INSTALLATION

A. Install as shown on Design Documentation and Installation Details.

B. As recommended by the Manufacturer’s Installation and Operation Manual.

C. Wiring between pressure transmitters and remote mounted sensors shall use cable or capillaries per the manufacturer recommendations. Provide sufficient cable or tubing from transmitter location to the location of the local display. Confirm cable lengths prior to submitting Shop Drawings.

D. Minimize the number of fittings used to build process connection assemblies. Provide low-volume/internal diameter fittings and valves in constructing pressure device assemblies, especially in instances of a multiple device connection point.

E. Provide means of isolation and removal or pressure measurement devices without disruption of process service or shutdown. Bleed system to allow for removal of trapped air to prevent measurement inaccuracy.

F. For flanged connections, verify bolts and gaskets are compatible with the flange pressure rating. Verify gasket material is compatible with process medium.

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G. Provide all required accessories for installation and install per Manufacturer's recommendations, including but not limited to instrument tagging, mounting brackets, gaskets, and associated hardware.

H. All instruments shall be fully protected after installation and before commissioning. Replace any instruments subject to damage in accordance with Engineer approved corrective measures.

I. DIAPHRAGM AND ANNULAR SEALS

1. Fill fluid and liner material for isolation rings shall be clearly labeled on the outer diameter of the seal.

3.3 DELIVERY, STORAGE, AND HANDLING

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the Manufacturer.

B. Any instruments that are not stored in strict conformance with the Manufacturer's recommendation shall be replaced.

3.4 TESTING

A. Each device shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required.

B. Each device shall be subjected to an operating test over the total measurement range of the instrument.

C. The Contractor shall provide documented evidence of pressure testing.

D. Isolate and protect instruments where in-situ testing is outside of instrument allowable range which may cause damage to the device.

3.5 CLEANUP

A. After completion of installation and testing of device operation, the Contractor shall remove all debris from the site, clean all gauges, cabinets, and appurtenance. The Contractor shall submit each system to the Owner in final operating condition.

B. Provide to Owner all associated documentation including manuals, completed data sheets, configuration settings, certificates of calibration, etc.

END OF SECTION 40 73 00

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SECTION 40 79 23 – TESTING, CALIBRATION, AND COMMISSIONING

PART 1 - GENERAL

1.1 GENERAL PROCEDURES FOR INSPECTION, TEST, AND INSTRUMENT CALIBRATION

A. Each instrument shall be checked against the latest version of the design documents for tagging, manufacturer, model number, range, action, etc., before functional testing or calibration.

B. Any air system, permanent or temporary, used for energizing instrumentation shall be dry and clean at all times, and be blown down thoroughly before use. Any connection between the air supply system shall be via proper filter and regulator.

C. Plastic sealing plugs shall be used for all pneumatic connections and tubing except during test and immediately before final connection in the field.

D. Care shall be observed when connecting electric power supplies to the instrumentation. Insure correct voltage and frequency on AC power supplies. Insure correct voltage, polarity, and superimposed ripple on DC power supplies. Insure correct polarity of the supply and proper grounding before connecting instruments.

E. The Instrumentation and Control Systems Contractor shall satisfy the requirement that the installation, calibration, and checkout of the instruments meet the requirements of the project specifications.

F. The Calibration procedures for verifying instrument precision should conform to accepted practices as outlined in ASTM, ASHRAE, ISA, etc. specifications.

G. The Instrumentation and Control Systems Contractor shall provide copies of manufacturer’s installation and calibration instructions to the calibration technicians prior to the commencement of calibration.

1.2 INSTRUMENT QUALITY LEVELS AND METEROLOGY

A. Instrumentation supplied for the calibrating sensing instruments for facility control system shall include documentation concerning the calibration method and traceability to the National Institute for Standards and Testing (NIST).

B. Process instrumentation shall be field checked for accuracy before installation even if the instruments have been calibrated by the manufacturer’s metrology facilities.

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PART 2 - PRODUCTS

2.1 CALIBRATION AND TEST EQUIPMENT

A. All calibration and test equipment shall be in proper working order and calibrated using traceable standards and equipment set by the NIST. Certificates of traceability shall be kept on file in the field calibration office or field project office. Copies of the traceability documents shall be included with the submittal of the calibration forms.

B. All calibration and test equipment shall carry a documented current calibration sticker reflecting the date of the last calibration and the name or initials of the technician who performed the calibration. A current calibration will be performed before the equipment is shipped to the site. The calibration equipment shall be shipped directly from the calibrating authority to the site, in packaging provided by the calibrating authority. A current calibration will be performed for all calibration or test equipment every 180 days or within the normal calibration interval, whichever is less.

C. Any field instruments calibrated with test equipment whose calibration has expired will be rejected and will be required to be recalibrated.

D. All Calibration and test equipment shall be of a higher accuracy than the instrument being calibrated. The manufacturer's recommendations for calibration accuracy will prevail in all instances.

E. The Control Systems Contractor shall supply calibration and test equipment of sufficient quantity, quality, and type to calibrate the instruments and sensors used in the installation.

2.2 BENCH TEST AND CALIBRATION FORMS AND METHODOLOGY

A. Calibration forms and calibration procedures for each instrument type shall be generated by the Instrumentation and Control Systems Contractor and approved by the Owner or their representative before proceeding with any calibrations. The manufacturer's procedures or the Owner's existing procedures shall form the basis for the calibration procedure.

B. The following format shall be used for instrument calibration form:

1. A separate calibration form shall be generated for similar types of instruments that have different accuracy and tolerance requirements.

2. The form shall contain as found and as calibrated data areas. The form shall contain areas for the calibrating and test instruments manufacture, serial number, and date of calibration.

3. The forms shall be filled out and signed in black ink.

4. Those instruments that can shall be calibrated on the bench under controlled conditions. Care shall be taken with those instruments that must be calibrated in the field to approximate the conditions of the bench test.

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PART 3 - EXECUTION

3.1 GENERAL

A. The Control Systems Contractor shall calibrate all instrumentation in an environment suitable to quality testing procedures. High accuracy comparative instruments or mechanisms shall be the standard against which instrument calibration is tested.

B. Verify that all process and test instruments have been calibrated and traceable to the NIST or other appropriate reference standards. Verify that a calibration sticker has been affixed to the instrument and that each instrument is within its calibration period at the time that the calibration is performed.

C. Each instrument shall be calibrated as per Owner approved calibration procedures and forms.

D. Each instrument shall have a calibration sheet completely filled out with all pertinent data related to the calibration and system. These calibration sheets shall be organized in a binder by system and turned over to the Owner at the completion of the project.

E. Instruments shall have a calibration sticker placed on the instrument. The sticker shall not be placed until the instrument has successfully completed the calibration procedure and the associated calibration form has been filled out and signed. The sticker shall bear the date of calibration and expiration and initials of the technician certifying calibration.

END OF SECTION 40 79 23

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SECTION 43 05 01 - EQUIPMENT GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The provisions of this Section apply to all sections of Divisions 43 unless specifically revised therein.

B. Furnish each piece of equipment complete with its base, drives, shafting, couplings, controls, guards, and other appurtenances which are specified or are required for proper and safe operation.

C. Furnish any special tools or equipment required for proper operation maintenance, testing, or adjusting.

1.2 REFERENCE STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01 42 19 – Reference Standards.

B. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:

1.	AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
2.	ASTM	American Society for Testing and Materials
3.	ANSI	American National Standards Institute
4.	ASME	American Society of Mechanical Engineers
5.	AWWA	American Water Works Association
6.	ASHREA	American Society of Heating, Refrigerating, and Air Conditioning Engineers
7.	AWS	American Welding Society
8.	NFPA	National Fire Protection Association
9.	NEMA	National Electrical Manufacturers Association
10.	OSHA	General Industry Safety Orders

C. The following standards are referenced in this and other Divisions 41 to 43 and Division 46:

1.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800

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2.	ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy and other Special Alloys
3.	ANSI B46.1	Surface Texture
4.	ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
5.	ASME B1.20.1	General Purpose Pipe Threads (Inch)
6.	ASME B31.1	Power Piping
7.	AWWA C206	Field Welding of Steel Water Pipe
8.	AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144-inches (100 mm through 3,600 mm)
9.	AWWA D100	Welded Steel Tanks for Water Storage
10.	ASTM A48	Gray Iron Castings
11.	ASTM A108	Steel Bars, Carbon, Cold-Finished, Standard Quality
12.	ASME B17.1	Keys and Keyseats
13.	ASME B106.1M	Design of Transmission Shafting

1.3 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00 – Submittal Procedures and the specific equipment specifications sections.

B. Shop Drawings: Furnish complete drawings and technical information for equipment, piping, valves, electrical and controls. Where indicated or required by the Engineer, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements proposed by the Contractor.

C. Spare Parts List: The Contractor shall obtain from the manufacturer and submit at the same time as Shop Drawings a list of suggested spare parts for each piece of equipment. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment.

D. Operation and Maintenance Manual: Provide technical operation and maintenance manuals in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.4 ADAPTATION OF EQUIPMENT

A. The Contractor shall furnish equipment readily adaptable for installation and operation. Equipment furnished shall be compatible with all other equipment furnished under the Contract.

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B. The Contractor shall assume full responsibility for all modifications of mechanical and electrical controls, equipment, wiring, piping, as required to accomplish function intended by the Contract Documents.

1.5 QUALITY ASSURANCE

A. Guarantees: Unless otherwise accepted herein, guarantee all equipment and its install required. Guarantees shall cover the following: (1) Faulty or inadequate design; (2) improper assembly or erection; (3) leakage, breakage, or other failure; and (4) defective workmanship or materials.

B. Inspection, Start-up, and Field Adjustment: The Contractor shall demonstrate that all equipment meets the specified performance requirements. Contractor shall provide the services of an experienced, competent, and authorized service representative of the manufacturer of each item of major equipment who shall visit the site of Work to perform the following tasks:

1. Assist the Contractor in the installation of the equipment.

2. To inspect; check; adjust, if necessary; and approve the equipment installation.

3. To start-up and field-test the equipment for proper operation, efficiency, and capacity.

4. To perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the Engineer.

5. To instruct the Owner's personnel in the operation and maintenance of the equipment. Instruction shall include step-by-step trouble shooting procedures with all necessary test equipment.

C. Quality and Tolerances: Tolerances and clearances shall be as shown on the Shop Drawings and shall be closely adhered to.

D. Machine Finish: The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1

E. Manufacturer's Experience: Equipment manufacturer shall have a record of at least 5 years of successful, trouble free operation in similar applications and size equal or larger than the equipment in this contract.

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PART 2 - PRODUCTS

2.1 GENERAL

A. Protection of Equipment: Equipment shall be boxed, crated, or otherwise protected from damages and moisture during shipment, handling, and storage. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weather tight storage facilities prior to installation. For extended storage period, plastic equipment wrappers shall be avoided to prevent accumulation of condensate in gears and bearings. In addition, motor space heaters shall be energized, and shafts shall be rotated. Equipment delivered to the Site with rust or corroded parts shall be rejected. If equipment develops defects during storage, it shall be disassembled, cleaned and recoated to restore it to original condition.

B. Identification Equipment Items: At the time of shipping, each item of equipment shall have a legible identifying mark corresponding to the equipment number in the Contract Documents for the particular item.

C. Protective Coating: Equipment shall be painted or coated in accordance with Section 09 90 00 – Painting and Coating, unless otherwise indicated. Non-ferrous metal and corrosive-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly and shipping.

D. Controls: Equipment and system controls shall be in accordance with Division 26 and Division 40.

E. All flanges on equipment and appurtenances provided under this Section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME B1.20.1, and with requirements of Section 40 05 00– Piping, General.

F. Nameplates: Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer’s name, model, serial number, size, characteristics, and appropriate date describing the machine performance ratings.

G. Tools: The Contractor shall furnish one complete set of special wrenches and other special tools necessary for the assembly, adjustment, and dismantling of the equipment. Tools shall be of best quality hardened steel forgoing with bright finish. Wrench heads shall have work faces dressed to fit nuts. Tools shall be suitable for professional work and manufactured by Snap On, Crescent, Stanley, or equal. The set of tools shall be neatly mounted in a labeled toolbox of suitable design provided with a hinged cover.

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H. Lubricants: The Contractor shall install lubricants for all equipment during storage and prior to initial testing of the equipment. After successful initial testing, final testing, and satisfactory completion startup testing as specified in Section 01 75 16 – Startup Procedures, the Contractor shall conduct one complete lubricant change on all equipment. In addition, the Contractor shall be responsible for the proper disposal of all used lubricants. The Owner will then be responsible for subsequent lubricant changes.

I. Hazardous Location Rating of Equipment: Equipment manufacturer shall reference the hazardous-area classification drawing in the Contract Documents and provide equipment in compliance with the defined NEC- classification requirements. It will be the manufacturer's sole responsibility to submit equipment in compliance with the Contract Documents, NFPA 820, and NEC requirements.

2.2 EQUIPMENT SUPPORTS

A. All pipe connections to equipment shall be supported, anchored and guided to avoid stresses and load on equipment flanges and equipment. Supports and hangers shall be in accordance with the requirements of Section 43 05 50 - Equipment Mounting.

2.3 NOISE REQUIREMENTS

A. Noise Level: When in operation, no single piece of equipment shall exceed the OSHA noise level requirement of 105 dBA for one-hour exposure per day.

B. High Noise Level Location: The Contractor shall provide two personal hearing protection stations at the Blower Room.

C. Personal Hearing Protection: In each hearing protection station, the Contractor shall furnish three pairs of high attenuation hearing protectors in the original unopened packaging. The ear protectors shall be capable of meeting the requirements of ANSI S12.6 and shall produce a noise level reduction of 25 dBA at a frequency of 500 Hz. The hearing protectors shall have fluid filled ear cushions and an adjustable, padded headband. The protectors shall be stored in a weatherproof, labeled, steel cabinet, provided at an approved location near the noise producing equipment.

2.4 VIBRATION LIMITATIONS

A. Vibration frequencies shall span the range from 5.0 to 5,000 Hz. Where specified, measurements shall be obtained while the installed equipment is operating within the specified speed range.

B. Centrifugal Machines with Sleeve Bearings: Unless otherwise specified, centrifugal machines with sleeve bearing shafts shall not exhibit unfiltered RMS readings for vibration displacement in excess of the following:

Shaft speed range range, rpm	Displacement peak to peak, mils
Up to 900	3.5
901-1800	3.0

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1801-3000	2.5
3001-4500	2.0
Above 4500	1.6

Displacement measurements shall be taken radially on the shaft at two points at each bearing. Measuring points shall be 90 degrees apart.

C. Centrifugal Machines with Antifriction Bearings: Unless otherwise specified, centrifugal machines with antifriction bearing shafts shall not exhibit unfiltered RMS readings for vibration velocity in excess of 0.12 inch per second. Velocity measurements shall be taken on one point of each bearing housing.

D. Positive Displacement Machines: Unless otherwise specified, positive displacement machines of the rotary, reciprocating and controlled volume types shall operate without any lateral or torsional vibration characteristics that may accelerate wear of the equipment. The Contractor shall provide manufacturer's certification that the manufacturer has inspected the machine under operating conditions and found it to comply with the manufacturer’s requirements.

E. Vibration Isolators: Air compressors, blowers, engines, inline fans shall be provided with restrained spring-type vibration isolators or pads per manufacturer's written recommendations. Vibration isolations shall be provided with seismic restraint.

2.5 CRITICAL SPEED REQUIREMENTS

A. Unless otherwise specified, rotating mechanical equipment shall not exhibit critical speeds within the specified range of operating speeds and impeller blade pass frequencies. Critical speeds for equipment with rigid rotor systems shall be at least 20 percent greater than maximum operating speed and maximum impeller blade pass frequency, whichever is greater. Critical speeds for equipment with flexible shaft-rotor systems shall be at least 15 percent below minimum operating speed and 20 percent above maximum operating speed and blade pass frequency.

2.6 DRIVE TRAINS AND SERVICE FACTORS

A. Drive Trains and Service Factors: Service factors shall be applied in the selection or design of mechanical power transmission components. All components of drive train assemblies between the prime mover and the driven equipment shall be designed and rated to deliver the maximum peak or starting torque, speed, and horsepower. All of the applicable service factors shall be considered, such as mechanical (type of prime mover), load class, start frequency, ventilation, ambient temperature, and fan factors. Drive train components include couplings, shafts, gears, and gear drives, drive chains, sprockets, and V-belt drives. Unless otherwise indicated, the following load classification shall apply in determining service factors:

Type of Equipment	Service Factor	Load Classification
Pumps		

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Centrifugal or Rotary Reciprocating	1.0 1.8	Uniform Moderate Shock

B. Mechanical Service Factors

	Mechanical Service Factors
Uniform	1.25
Moderate Shock	1.50
Heavy Shock	2.0

C. For thermal rating adjustments, such as start frequency, ambient temperature, and hourly duty cycle factor, ventilation factor, and fan factor, refer to gear manufacturer sizing information.

D. For service factors of electric motor, see Section 40 05 93 – Common Motor Requirements for process Equipment

Where load classifications are not indicated, service factors based on AGMA 514.02 shall be used for standard load classification and for flexible couplings.

2.7 SHAFTING

A. Shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. Shafts shall rotate in the end bearings and shall be turned and polished, straight, and true.

B. Design Criteria: All shafts shall be designed to carry the steady state and transient loads suitable for unlimited number of load applications, in accordance with ASME B 106.1 M - Design of Transmission Shafting. Where shafts are subjected to fatigue stresses, such as frequent start and stop cycles, the mean stress shall be determined by using the modified Goodman Diagram. The maximum torsional stress shall not exceed the endurance limit of the shaft after application of the factor of safety of 2 in the endurance limit and the stress concentration factor of the fillets in the shaft and keyway. Stress concentration factor shall be in accordance with ASME Standard B17.1 - Keys and KeySeats.

C. Materials: Shafting materials shall be appropriate for the type of service and torque transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be as indicated unless furnished as part of an equipment assembly.

1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.

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2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.

3. Other grades of carbon steel alloys shall be suitable for service and load.

4. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for the intended service.

D. Differential Settlement: Where differential settlement between the driver and the driven equipment may occur, a shaft of sufficient length with sets of universal type couplings shall be provided.

2.8 BEARINGS

A. Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).

B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and lubrication shall be considered in bearing selection.

C. All re-lubricatable type bearings shall be equipped with an hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in the bearing chamber.

D. All lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.

E. Anti-Friction Type Bearing Life: Except where otherwise indicated, bearings shall have a minimum 10 life expectancy of 10 years or 20,000 hours, whichever occurs first. Where so indicated, bearings shall have a minimum rated L-10 life expectancy corresponding to the type of service, as follows:

Type of service	Design Life, years	L-10 Design Life, hours
	(Whichever comes first)	
8-hour shift	10	20,000
16-hour shift	10	40,000
Continuous	10	60,000

F. Bearing housings shall be of cast iron or steel and bearing mounting arrangement shall be as indicated or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.

G. Sleeve Type Bearings: Sleeve-type bearings shall have a steel, cast iron or ductile iron housing and Babbitt or bronze liner. Bearing housing shall be bolted and doweled to the lower casing half. These housings shall be provided with cast iron caps bolted in place and the bearing end caps shall be bored to receive the bearing shells. Sleeve bearings shall be designed on the basis of the maximum allowable load permitted by the bearing manufacturer. If the sleeve bearing is connected to an equipment shaft with a coupling, the coupling transmitted thrust will be assumed to be the maximum motor or equipment

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thrust. Lubricant, lubrication system, and cooling system shall be as recommended by the bearing manufacturer.

H. Plate Thrust Bearings: Thrust bearings shall be the Kingsbury Type, designed and manufactured to maintain the shaft in the fixed axial position without undue heating or the necessity of adjustment or attention. Bearings shall be oil lubricated to suit the manufacturer's standard method of lubrication for the specific bearing. If bearing cooling is required, manufacturer shall provide necessary piping, filters, and valves.

2.9 ELECTRIC MOTORS

A. All motors shall comply with requirements listed in Section 40 05 93 – Common Motor Requirements for Process Equipment.

2.10 SPARE PARTS

A. Spare parts, where specified, shall be provided in clearly labeled boxes. Labels shall display “City of Sandpoint", the major piece of equipment to which the part belongs, the part name, and the manufacturer's part number.

PART 3 - EXECUTION

3.1 PROTECTION

A. Box, crate, or otherwise completely enclose and protect all equipment during shipment, handling, and off-site storage. Responsibility for storage on the job site will be assigned to the installing Contractor.

B. Protect equipment from exposure to elements and keep all items thoroughly dry at all times. Protect against impact, abrasion, discoloration and other damage. Protect electrical equipment, controls and insulation against moisture, freezing, or water damage.

3.2 INSTALLATION

A. Equipment shall be installed in accordance with the manufacturers written recommendations. The Contractor shall select or recommend the size and type of coupling required to suit each specific application; installation shall be per equipment manufacturer's printed recommendations. All insulating connections shall be installed in accordance with the manufacturer's printed instructions.

B. Alignment: Equipment shall be field tested to verify proper alignment.

3.3 SERVICES OF MANUFACTURER

A. Inspection, Startup, and Field Adjustment: Where required by individual sections, an authorized, experienced, and competent service representative of the manufacturer shall visit the Site for the number of days indicated in those sections to witness or perform the following and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.

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1. Installation of equipment

2. Inspection, checking, and adjusting the equipment and approving its installation

3. Startup and field testing for proper operation, efficiency, and capacity

4. Performing field adjustments during the test period to ensure that the equipment installation and operation comply with requirements

B. Instruction of the Owner's Personnel: Where required by the individual equipment sections, an authorized training representative of the manufacturer shall visit the Site for the number of days indicated in those sections to instruct the Owner's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment. Instruction shall be specific to the models of equipment provided.

1. The representative shall have at least two years' experience in training. A resume of the representative shall be submitted.

2. Training shall be scheduled three weeks in advance of the scheduled session.

3. Proposed training material and a detailed outline of each lesson shall be submitted for review. Review comments from the Engineer shall be incorporated into the material.

4. The training materials shall remain with the trainees after the session. The Contractor shall videotape the training for later use by the Owner's personnel.

3.4 FIELD TESTS

A. Where indicated by the individual equipment sections, equipment shall be field tested after installation to demonstrate satisfactory operation without excessive noise, vibration, or no overheating of bearings or motor.

B. The following field testing shall be conducted:

1. Start, check, and operate the equipment over its entire operating range. Vibration level shall be within the amplitude limits as indicated or as recommended by the reference applicable Standards.

2. Obtain, record and provide to Engineer concurrent readings of motor voltage, amperage, capacity, vibration, and bearing temperatures for each piece of major equipment.

C. The Engineer shall witness field testing. The Contractor shall notify the Engineer of the test schedule seven days in advance.

D. In the event that any equipment fails to meet the test requirements, the equipment shall be modified and resettled until it satisfies the requirement.

END OF SECTION 43 05 01

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SECTION 43 05 50 - EQUIPMENT MOUNTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies mounts, supports, and the anchorage for equipment, tanks, piping and accessories.

1.2 REFERENCE STANDARDS

A. Federal Specifications

1.	MIL-A-907E	Antiseize Thread Compound, High Temperature

B. Commercial Standards

1.	ASTM A 48	Gray Iron Castings
2.	ASTM A 193	Alloy Steel and Stainless Steel Building Materials for High Temperature Service
3.	ASTM A 194	Carbon and Allow Steel Nuts for Bolts for High Pressure and High Temperature Service
4.	ASTM A 307	Carbon Steel Bolts and Studs, 600,000 psi Tensile Strength
5.	ASTM A 325	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

1.3 SUBMITTALS

A. Calculations and shop drawings shall be submitted for all of the work required above in accordance with Section 01 33 00 – Submittal Procedures. Anchor bolt and expansion bolt submittals shall be in accordance with requirements specified herein. All calculations must be made and signed by a civil or structural engineer currently registered in the State of Idaho.

B. Inasmuch as some anchorage or equipment mounting is to be made to poured-in-place concrete elements, it is imperative that these types of anchorage be coordinated with the concrete subcontractor so that anchorage may be installed at time of pouring. If calculations and anchorage details are not submitted prior to pouring of concrete, the Contractor shall become responsible for any strengthening of concrete elements because of superimposed seismic loading.

1.4 QUALITY ASSURANCE

A. Support, anchorage and mounting of all tanks, piping and equipment shall be designed and provided by Contractor according to manufacturer's recommendation, 2018 International

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Building Code and industry standards requirements, unless otherwise specified. All elements required to resist the calculated forces described herein or required by the equipment manufacturer shall be provided by the Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment mountings shall be as shown. All equipment located in floor slabs shall be mounted on concrete pads. Where a steel or cast base is shown or specified between the equipment and the concrete pedestal, it shall be hot-dip galvanized after fabrication.

B. For belt driven equipment shown as in-line and piggyback, the base shall be rectangular, and the motor shall always be behind and above the driven equipment and never over the driven equipment unless approved by the Engineer. Motor mounting hardware for any belt driven configuration shall allow for belt tension adjustment.

2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

A. Steel Bases: Structural steel bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases, which may be "T" or "L" 1 shaped where shown. Pump bases for split case pump shall include supports for suction and discharge base ells. All perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Grout holes shall be provided for the bases of all equipment where vibration isolation is not specified. Where vibration isolation is required, height saving brackets shall be employed in all mounting locations to provide a base clearance of 1 inch.

2.3 CONNECTIONS

A. All pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with the requirements of Section 40 05 07 – Hangers and Supports for Process Piping.

B. Flanges and Pipe Threads: All flanges on equipment and appurtenances provided under this Section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME B1.20.1, and with requirements of Section 40 05 00 – Piping, General.

C. Unless otherwise indicated, equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greater of that noted in the general structural notes, as required by the governing building code, or 10 percent of gravity. Submitted design calculations for equipment supports shall bear the signature and seal of an engineer registered in the state wherein the project is to be built, unless otherwise indicated.

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D. Equipment Foundations: Mechanical equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 4-inch-high concrete bases unless otherwise indicated. Equipment foundations are indicated on Drawings. The Contractor through the equipment manufacturer shall verify the size and weight of equipment foundation to insure compatibility with equipment.

E. Couplings: Mechanical couplings shall be provided between the driver and the driven equipment, as indicated in the relevant specification section. Flexible couplings shall be provided between the driver and the driven equipment to accommodate sight angular misalignment, parallel misalignment, end float, and to cushion shock loads.

1. Each coupling size shall be determined based on the rated horsepower of the motor, speed of the shaft, and the load classification service factor. The Contractor shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application.

2. Taper-Lock or equal bushing may be used to provide for easy installation and removal of shafts of various diameters.

2.4 ANCHOR BOLTS

A. The CONTRCTOR shall be responsible in providing anchor bolts for all owner–furnished and other equipment supplied to this project. For all bolts, nuts, and washers requirements see Section 05 50 00 – Metal Fabrications.

B. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum oversizing of 1/4 inch. Minimum anchor bolt diameter shall be 1/2 inch. Anchor bolts shall be furnished with leveling nuts, the faces of which shall be tightened against flat surfaces as shown to not less than 10 percent of the bolt's safe tensile stress.

C. Tapered washers shall be provided where mating surface is not square with the nut.

D. Adhesive anchors shall comply with requirements listed in Section 05 50 00 – Metal Fabrications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each piece of equipment shall be anchored to resist a minimum lateral force required by the code, the manufacturer of the equipment or a lateral seismic force of 40 percent of the operating weight of the equipment, whichever is greater. This force shall be considered acting at the center of gravity of the piece under consideration. No equipment shall be anchored to vertical structural elements without written approval of the Engineer.

B. Equipment which is not vibration isolated shall be anchored directly to the, supporting floor system. In addition to the anchorage, all such equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the imposed seismic force. All forces must be transmitted to the base in order to be anchored

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as required. Vibration isolated equipment shall be specially designed to meet these same requirements.

C. Equipment, tanks, piping supports, and anchorage located outside the building shall be designed to comply with 2018 International Building Code requirements.

D. All piping, raceways, accessories, and appurtenances, furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.

END OF SECTION 43 05 50

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SECTION 43 20 00 - PUMPS, GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide and install all pumps and pumping appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section apply to all pumps and pumping equipment except where otherwise indicated in the Contract Documents.

C. Unit Responsibility: The pump manufacturer shall be made responsible for furnishing the Work and for coordination of design, assembly, testing, and installation of the Work of each pump section; however, the Contractor shall be responsible to the Owner for compliance with the requirements of each pump section.

1.2 REFERENCE STANDARDS

A.	ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
B.	ANSI/IEEE 115	Test Procedure for Synchronous Machines
C.	ANSI/HI 9.6.4	Centrifugal and Vertical Pumps – Vibration Measurements and Allowable Values
D.	ANSI/HI 14.6	Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
E.	ASTM A 48	Gray Iron Castings
F.	ASTM B 62	Composition Bronze or Ounce Metal Castings,
G.	ASTM B 584	Copper Alloy Sand Castings for General Applications
H.	ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
I.	ANSI/ASME B16.5	Pipe Flanges and Flanged Fittings

1.3 SUBMITTALS

A. Shop Drawings shall be submitted in accordance with Section 01 33 00 – Submittal Procedures. At a minimum, the following information shall be submitted with each pump supplied:

1. Pump name, identification number, and specification section number.

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2. Performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump. The equipment manufacturer shall indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions.

3. The Contractor shall require the manufacturer to indicate the limits on the performance curves recommended for stable operation without surge, cavitation, or excessive vibration. The stable operating range shall be as wide as possible based on actual hydraulic and mechanical tests.

4. Assembly and installation drawings including shaft size, seal, coupling, bearings, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.

5. Data, in accordance with Section 40 05 93 – Common Motor Requirements Process Equipment, for the electric motor proposed for each pump.

6. Elevation of proposed local control panel showing panel-mounted devices, details of enclosure type, single line diagram of power distribution, and current draw of panel, and list of all terminals required to receive inputs or to transmit outputs from the local control panel.

7. Wiring diagram of field connections with identification of terminations between local control panels, junction terminal boxes, and equipment items.

8. Complete electrical schematic diagram.

B. Technical Manual: The Technical Manual shall contain the required information for each pump section.

C. Spare Parts List: A spare parts list shall contain the required information for each pump section.

D. Factory Test Data: Signed, dated, and certified factory test data for each pump system which requires factory testing, submitted before shipment of equipment.

E. Certifications: The Contractor shall provide Manufacturer's certification of proper installation and certification of satisfactory field testing.

1.4 FACTORY TESTING

A. Motors: Electric motors shall be tested in accordance with Section 40 05 93 – Common Motor Requirements for Process Equipment.

B. The following minimum test results shall be submitted:

1. At maximum speed, a minimum of five hydraulic test readings between shutoff head and 25 percent beyond the maximum indicated capacity, recorded on data sheets as defined by the Hydraulic Institute.

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2. Pump curves showing head, flow, bhp, and efficiency requirements. Include calculated NPSH required curve and certification that the pump shaft horsepower demand did not exceed the rated motor horsepower of 1.0 service rating at any point on the curve, unless specified otherwise.

C. Acceptance: In the event of failure of any pump to meet any of the requirements, the Contractor shall make all necessary modifications, repairs, or replacements to conform to the requirements of the Contract Documents and the pump shall be retested until found satisfactory.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compliance with the requirements of the individual pump sections may necessitate modifications to the manufacturer's standard equipment.

B. Performance Curves: All centrifugal pumps shall have a continuous rising curve, or the system operating range shall not cross the pump curve at two different capacities or "dip region." Unless indicated otherwise, the required pump shaft horsepower at any point on the performance curve shall not exceed the rated horsepower of the motor or engine or encroach on the service factor.

C. Each unit of pumping equipment shall incorporate all basic mechanisms, couplings, electric motors or engine drives, variable speed controls, necessary mountings, and appurtenances.

D. Redundancy: Unless otherwise specified, the Contractor shall provide pumps for each intended service in a lead/lag configuration. For each service, a minimum of two pumps shall be provided, unless otherwise specified, each sized to meet design flow conditions.

E. Hazardous Location Rating of Equipment: Equipment manufacturer shall reference the hazardous-area classification drawing in the Contract Documents and provide equipment in compliance with the defined NEC- classification requirements. It will be the manufacturer's sole responsibility to submit equipment in compliance with the Contract Documents, NFPA 820, and NEC requirements.

2.2 MATERIALS

A. All materials shall be suitable for the intended application; materials not indicated shall be high-grade, standard commercial quality, free from all defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended and shall conform to the following requirements.

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Casings and Bowls	Cast iron pump casings and bowls shall be of close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or equal.
Impellers	Bronze pump impellers shall conform to ASTM B 62 - Composition Bronze or Ounce Metal Castings, or B 584 - Copper Alloy Sand Castings for General Applications, where dezincification does not occur.
Shafts	Stainless steel pump shafts shall be Type 416 or 316. Miscellaneous stainless-steel parts shall be Type 316.
Anchor Bolts	Anchor bolts, washers, and nuts in non-corrosive areas, shall be galvanized steel. Anchor bolts, washers, and nuts in corrosive or submerged conditions shall be stainless steel.

2.3 PUMP COMPONENTS - GENERAL

A. Flanges and Bolts: Suction and discharge flanges shall conform to ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800 or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings dimensions.

B. Lubrication: Pumps for sewage, sludge and other process fluids shall be lubricated as indicated.

C. Handholes: Handholes on pump casings shall be shaped to follow the contours of the casing to avoid any obstructions in the water passage.

D. Drains: All gland seals, air valves, cooling water drains, and drains from variable speed drive equipment shall be piped to the nearest floor sink or drain, with galvanized steel pipe or copper tube, properly supported with brackets.

E. Mechanical Seals: Mechanical seals shall be fresh water-flushed unless indicated otherwise; in which case product water cleaned by a solids separator as manufactured by Lakos, or equal.

1. Mechanical seals for all services shall be equipped with non-clogging, flexible-mounted seats with elastomer secondary seals. Wetted metal parts shall be Type 316 stainless steel, Alloy 20, or Hastelloy B or C, whichever has the best corrosion resistance to the pumped fluid. Dual cartridge seals shall be double balanced to allow for seal integrity in case of flush water pressure reversal. All single and double seals shall have springs in the non-wetted end of the seal.

2. Fresh water shall be delivered to the seals through appropriate size piping with plug valves, strainers, pressure regulators, electrically operated solenoid valves, and rotameters. Wiring shall comply with Division 26 and solenoid control shall comply with Division 40.

2.4 PUMP APPURTENANCES

A. Nameplates: Each pump shall be equipped with a stainless-steel nameplate indicating serial numbers, rated head and flow, impeller size, pump speed, and manufacturer's name and model number.

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B. Solenoid Valves: If applicable, the pump manufacturer shall provide solenoid valves on the water or oil lubrication lines and on all cooling water lines. Solenoid valve electrical ratings shall be compatible with the motor control voltage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Pumping equipment shall be installed in accordance with the manufacturer's written recommendations.

B. Alignment: All equipment shall be field tested to verify proper alignment and freedom from binding, scraping, shaft runout, or other defects. Pump drive shafts shall be measured just prior to assembly to ensure correct alignment without forcing. Equipment shall be secure in position and neat in appearance.

C. Lubricants: The Contractor shall provide the necessary oil and grease for initial operation.

3.2 SERVICES OF MANUFACTURER

A. Instruction of the Owner's Personnel: An authorized training representative of the manufacturer shall visit the Site for the number of days as indicated in the individual pump specification to instruct the Owner's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment. Instruction shall be specific to the models of equipment provided.

1. The representative shall have at least two (2) years' experience in training. A resume for the representative shall be submitted a minimum of 4 weeks prior to the site visit.

2. Training shall be scheduled a minimum of three (3) weeks in advance of the first session.

3. Proposed training material and a detailed outline of each lesson shall be submitted for review. Comments shall be incorporated into the material.

4. The training materials shall remain with the trainees. The Owner may videotape the training for later use with the Owner's personnel.

3.3 FIELD TESTING

A. Test Protocols: Startup, check, and operate the pump system over its entire speed range. The pump and motor shall be tested at max RPM. Unless otherwise indicated, vibration shall be within the amplitude limits recommended by the Hydraulic Institute Standards at a minimum of four pumping conditions defined by the Engineer.

1. Obtain concurrent readings of motor voltage, amperage, pump suction head, and pump discharge head for at max RPM. Check each power lead to the motor for proper current balance.

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2. Determine bearing temperatures by contact type thermometer. A run time until bearing temperatures have stabilized shall precede this test, unless insufficient liquid volume is available.

3. Electrical and instrumentation tests shall conform to the requirements of the sections under which that equipment is specified.

4. Field testing will be witnessed by the Engineer. The Contractor shall furnish 3 days advance notice of field testing.

B. In the event any pumping system fails to meet the indicated requirements, the pump shall be modified or replaced and re-tested as above until it satisfies the requirements.

C. After each pumping system has satisfied the requirements, the Contractor shall certify in writing that it has been satisfactorily tested and that all final adjustments have been made. Certification shall include the date of the field tests, a listing of all persons present during the tests, and the test data.

D. The Contractor shall be responsible for all costs of field tests, including related services of the manufacturer’s representative, except for power and water, which the Owner will bear. If available, the Owner's operating personnel will provide assistance in field testing.

3.4 PROTECTIVE COATING

A. Materials and equipment shall be coated per Manufacturer’s written instructions.

END OF SECTION 40 20 00

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SECTION 43 25 00 - SUBMERSIBLE NON-CLOG PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install submersible non-clog pumping equipment, associated appurtenances and controls as specified herein and as shown on the Drawings.

1.2 REFERENCE STANDARDS

A.	ASTM - A36/A36M-04	Standard Specification for Carbon Structural Steel
B.	ASTM A 48/A 48M	Standard Specification for Gray Iron Castings
C.	NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

D. NEMA Standards Publication MG 1-1998 (latest version) Motors and Generators

E. National Electric Code (NEC)

1.3 SUBMITTALS

A. Shop Drawings, at a minimum, shall have the following information and be submitted with each pump supplied:

1. Pump performance curves showing the following:

   a. head, horsepower demand, NPSH required, pump efficiency, and minimum submergence required at the design flow conditions

   b. the limits on the performance curves recommended for stable operation without surge, cavitation, or excessive vibration, with the stable operating range as wide as possible based on actual hydraulic and mechanical tests.

2. Assembly and installation drawings, including shaft size, seal, coupling, bearings, detailed anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights

3. Bearing life calculations

4. Rail system

5. Typical installation guides

6. Electrical motor data

7. Technical manuals and parts list

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8. Printed warranty

9. Management system certificate ISO 9001

10. Manufacturer’s equipment storage recommendations

B. Factory Test Data shall be signed, dated, and certified factory test data for each pump system which requires factory testing, submitted before shipment of equipment.

C. The Contractor shall provide Manufacturer's Certification of proper installation and certification of satisfactory field testing.

D. Stamped anchorage calculations in accordance with 43 05 00 – Equipment Mounting.

E. Operation and Maintenance Data: Submit operation and maintenance data and parts list for the equipment. Include this data and product data in maintenance manual in accordance with Section 01 78 23 – Operation and Maintenance Data requirements.

1.4 QUALITY ASSURANCE

A. Pump, motor, and controls shall be coordinated by the Contractor to provide operable pumping systems as indicated by the Drawings and Specifications.

B. The motor horsepower shall not be exceeded when the pump is operating anywhere on its curve when accounting for motor service factor.

C. Firms regularly engaged in manufacture of pumping equipment of types required, whose equipment has been in satisfactory use in similar service for not less than 5 years. Manufacturer shall have authorized factory warranty service for pumps supplied available within 50-mile driving distance of the Owner.

D. The Contractor shall correct all defects in the pumping system upon notification from the Owner within 1 year from the date of Substantial Completion. Corrections shall be completed within 5 days after notification.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Submersible Wastewater Pumps shall be submersible non-clog wastewater pumps capable of pumping raw unscreened sewage in a NEC Class 1, Division 1, Group D hazardous location. Two identical pumps (lead/lag) shall be furnished and installed in the Superior Street Lift Station wet well.

B. The submersible pumps shall have a balanced, enclosed, vortex impeller designed to transport wastewater with fibrous materials like wet wipes.

C. Operating Conditions

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Criteria	Unit	Value
Design Flow Capacity (per pump) Max. point	gpm	350
Design Flow Pump Head, TDH	ft	23
Design Flow Minimum Pump Efficiency	Percent	49
Drive Duty	Continuous	
Drive	Constant Speed	
Maximum Pump Speed	rpm	900
Maximum Motor Speed	rpm	900
Maximum Motor Size	hp	**5**

Item	Unit	Value
Fluid Service		Raw wastewater
Ambient Environment		Wet well, submerged
Ambient Temperature	Degrees F	30 to 120
Ambient Relative Humidity	Percent	30 to 100
Fluid Temperature	Degrees F	40 to 80
Fluid pH Range		5 to 8.5
Fluid Specific Gravity		1.0
Project Site Elevation	Feet	2,075

D. The Contractor shall ensure the pump vendor examines the site conditions, intended application, and operation of the pump system and recommends the pump that will best satisfy the indicated requirements.

E. Pumps shall be designed and provided to be raised, lowered, and supported on a vertical stainless steel guide rail system.

2.2 MATERIALS OF CONSTRUCTION

A. Unless otherwise specified elsewhere, all non-clog submersible pumps shall be constructed of the following materials:

Item	Material	Construction
Pump Casing	Casing and motor housing shall be close-grain cast iron conforming to ASTM A-48 Class 30 standards.	Casing shall form the volute and shall be a single piece with smooth flow passages. The casing shall have a centerline discharge to allow for guide rails.

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Item	Material	Construction
Connections	Machined metal-to-metal quick disconnect type	The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two parallel guide bars extending from the top of the station to the wet well mounted discharge connection. The material of the guide bars shall Stainless steel AISI 316. Discharge flange connections shall be 4-inch and conform to the requirements of ANSI B16.1, Class 125.
Impeller	Impeller shall be of ASTM A48 Cast Iron Class 30 or ASTM A536 Ductile Iron Class 65	Impellers shall be dynamically balanced, enclosed, vortex, non-clog design. The impeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter found in wastewater.
Shaft	416 Stainless Steel, conforming to ASTM 8582. Shafts of carbon steel, chrome plated or spin welded shafts shall not be considered adequate or equal.	The pump shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start up condition or operating point in the system. The shaft shall be totally isolated from the liquid being pumped.
Shaft Seals	Tungsten carbide or silicon carbide rings	The lower seal shall be of the type 2 design and constructed of tungsten carbide/silicon carbide and be replaceable without disassembly of the seal chamber and without the use of special tools. The upperseal shall of the type 2100 design and constructed of silicon carbide. Each seal will not require routine maintenance or adjustment. For ease of maintenance both the lower and upper seals shall be locally available and of a standard design. Two electrical probes shall be provided in a sensing chamber positioned between the primary and secondary mechanical seal for

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Item	Material	Construction
		detecting the presence of water contamination within the chamber. The sensing chamber shall be fitted with environmentally safe nontoxic oil. The leakage chamber shall be equipped with probes that will signal if the chamber should reach 50% capacity.
Bearings		The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated and have a nominal B10 lifetime of 50,000 hours. The upper bearing shall be a heavy-duty radial single row ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Single row or sleeve lower bearings are not acceptable.
Oil Chamber		To supply oil for lubrication and cooling of shaft seals. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.
Pump Base	For each pump the contractor shall supply and install a discharge connection made of cast iron ASTM A-48, Class 35B	The sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be accepted. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump/motor unit shall bear on the sump floor directly or on a sump floor mounted stand.
Fasteners	Type 316 stainless steel	All exposed fasteners
Pump Coating	All castings must be blasted before coating. All wet surfaces are to be coated with polyamide epoxy. Zinc dust primer shall not be used.	All metal surfaces (except stainless steel) coming into contact with pumped media shall be protected by specified coating

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Item	Material	Construction
Cable Entry		The power cord will be SOOW or W, oil and water resistant 600v, 90C, UL and CSA approved and applied per NEC ampacities ratings at the cables rated temperature for intermittent/continuous duty. The pump shall be double protected with a compression fitting and an epoxy potted area that seals each conductor at the power cord entry to the pump. The power cable entry into the cord cap assembly shall first be made with a compression fitting.

2.3 LIFTING SYSTEM

A. Provide dual 316 SS guide rails extending from the base to the top of the wet well to provide for removal of the pump by lifting the pump without entering the wet well. The guide rail system shall be non-sparking.

B. Each pump shall be furnished with a stainless-steel bracket permanently mounted to the top of the pump, with a large loop for accommodating a lift hook. Each pump shall be fitted with a stainless steel lifting chain or lifting cable of adequate length. The working load of the lifting system shall be 50% greater than the pump unit weight.

C. The guide rail system shall include a sliding guide bracket that allows removal of the pump without binding, and properly aligns the pump to automatically seat with the pump discharge connection. Each pump shall have permanently installed discharge elbow that seats against the pump discharge connection by a machined metal to metal contact. The use of a diaphragm, O-ring, or profile gasket will not be accepted.

2.4 ELECTRICAL REQUIREMENTS

A. Pump Controls

1. Owner’s system integrator to provide motor starter for each pump. The motor starter shall include H-O-A selector switch and I/O to the PLC (in the LCP cabinet provided by the Owner's system integrator) that will provide the control capabilities specified in Section 40 61 96 – Control Strategies. In addition, outputs to PLC shall include hour meter and alarm lights for moisture switches, thermal switches, and pump failure for each pump.

B. Motor

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1. Pump motors shall be of explosion-proof design conforming to NFPA 820 requirements. In addition, pump motors shall conform to NEMA MG-1 Part 31 requirements and shall be a premium efficiency squirrel cage induction NEMA Design A electric motor conforming to the following:

Item	Value
Installation Environment	Submersible, Oil Filled
Enclosure	Explosion Proof
Insulation Class	NEMA Class H or higher
Insulation	Non-Hygroscopic Polyester
Service Factor	1.3 Minimum
Synchronous Speed	900 RPM Maximum
Voltage	240
Phase	3
Frequency	60 Hz

C. Moisture Sensor

1. Provide moisture sensor in the seal oil chamber to detect moisture leakage through the outer shaft seal. The moisture sensor shall be wired to the pump control system to provide seal failure protection indication for the pump. Provide a moisture detection relay for each pump suitable for connection to SCADA network for detection of moisture in the seal chamber. The moisture detection relay shall be powered by 24-volt AC/DC and shall close a set of contacts in the relay when moisture is present in the pump seal chamber.

D. Thermal Sensors

1. Thermal sensors shall be used to monitor stator temperatures by the use of 3 thermal switches embedded in the coils of the stator winding. The thermal sensors shall be wired to the pump control system to provide overheat protection for the motors and be connected to the SCADA network similar to moisture sensor.

E. Electric Cable

1. The pump motor cable and control cable shall be FM-approved for use with motors for Class 1, Division 1, Group C & D Locations.

2.5 SPARE PARTS

A. Parts to be furnished include:

1. 2 sets of mechanical shaft seals
2. 2 sets of bearings each for pump and motor
3. 3 sets of O-rings
4. 1 set of gaskets
5. 1 submersible cable of required length

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2.6 MANUFACTURER

A. Pentair Hydromatic, HPE series (Model S4LVXP)

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt or dust, or other contaminants.

B. All parts shall be properly lubricated and protected so that no damage or deterioration will occur even during a prolonged delay from the time of shipment until installation is completed and the pumps are ready for operation. Pump impellers shall be rotated at least every 30 days.

C. Finished ferrous surfaces not painted shall be properly protected to prevent rust and corrosion.

D. The finished surfaced of exposed flanges shall be protected by strong wooden blind flanges.

E. Each pump shall be properly crated to protect against damage during shipment.

3.2 INSTALLATION

A. Install pump as shown in the drawings and as recommended by the Pump Manufacturer.

B. The Contractor shall ensure that anchor bolts are set only after the discharge piping has been properly installed, to ensure exact fit with embedded piping components.

3.3 SERVICES OF MANUFACTURER

A. Secure start-up service for the pump as specified below:

Schedule of Field Service Representative on Site Time		
Service	On Site Time (Days)	Trips to Site
Installation verification, start-up and instruction of the Owner's personnel	1	1

B. A "Day on Site" is defined as a conventional 8-hour workday excluding travel time. A "Trip to Site" is defined as complete round trip travel from the Manufacturer's factory. All expenses including salary, local/long distance travel, lodging, meals and any other per diem or miscellaneous expenses of the authorized service representative shall be the responsibility of the Contractor.

C. A factory representative of the pumping equipment shall be present to supervise start-up and ensure proper operation of all components. The Contractor shall obtain and pay for the factory representative start-up service.

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D. The Contractor shall video tape the training session and provide a copy to the Owner.

END OF SECTION 43 25 00

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SECTION 43 26 20 - SUBMERSIBLE CHOPPER PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install submersible chopper pumping equipment, associated appurtenances, controls and control panel as specified herein and as shown on the Drawings.

1.2 REFERENCE STANDARDS

A.	ASTM - A36/A36M-04	Standard Specification for Carbon Structural Steel
B.	ASTM A 48/A 48M	Standard Specification for Gray Iron Castings
C.	NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

D. NEMA Standards Publication MG 1-1998 (Revision 3, 2002) *Motors and Generators*

E. National Electric Code (NEC)

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures and Section 43 20 00 – Pumps, General

B. Product Data: Submit manufacturer's technical product data including:

1. Pump performance curves per Section 43 20 00 – Pumps, General. Curves to show head, horsepower demand, NPSH required, pump efficiency, and minimum submergence required at the design flow conditions.

2. Assembly and installation drawings, including shaft size, seal, coupling, bearings, detailed anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights

3. Electric motor data and testing results per Section 43 20 00 – Pumps, General

4. Typical installation guides

5. Bearing life calculations

6. Rail system

7. List of spare parts for each pump

C. Factory Test Data shall be signed, dated, and certified factory test data for each pump system which requires factory testing, submitted before shipment of equipment.

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D. The Contractor shall provide Manufacturer's Certification of proper installation and certification of satisfactory field testing.

E. Stamped anchorage calculations in accordance with 43 05 00 – Equipment Mounting.

F. Operation and Maintenance Data: Submit operation and maintenance data and parts list for the equipment. Include this data and product data in maintenance manual, in accordance with Section 01 78 23 – Operation and Maintenance Data requirements.

1.4 QUALITY ASSURANCE

A. Pump, motor and controls shall be coordinated by the Contractor to provide operable pumping systems as indicated by the drawings and specifications. The motor horsepower shall not be exceeded when the pump is operating anywhere on its curve.

B. Pumps seals shall be designed for complete water tightness at 65 feet submergence for 30 minutes and data on factory testing and quality control shall be submitted with the Shop Drawings.

C. Manufacturers: Firms regularly engaged in manufacture of pumping equipment of types required, whose equipment has been in satisfactory use in similar service for not less than 5 years.

D. Warranty: The Contractor shall correct all defects in the pumping system upon notification from the Owner within one (1) years from the date of Substantial Completion. Corrections shall be started within five (5) days after notification.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Submersible Wastewater Pumps: Pumps shall be submersible centrifugal chopper design intended for services requiring a combined chopping and pumping action on fluids with entrained solids in a NEC Class 1, Division 1, Group D hazardous location. Two identical pumps (duty/standby) shall be furnished and installed in the City Beach Lift Station wet well.

a. Performance Requirements:

Criteria	Unit	Value
Design Flow Capacity (per pump)	gpm	250
Design Flow Pump Head, TDH	ft	34
Design Flow Pump Efficiency	Percent	57
Maximum Flow Shutoff Head	ft	60
Driver duty	Continuous	
Drive	Constant Speed	
Maximum Pump Speed	rpm	1,800

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Maximum Motor Speed	rpm	1,800
Maximum Motor Size	HP	7.5

2. OPERATING CONDITIONS

Item	Unit	Value
Fluid Service		Raw wastewater
Ambient Environment		Wet well, submerged
Ambient Temperature	Degrees F	20 to 120
Ambient Relative Humidity	Percent	30 to 100
Fluid Service		Scum
Fluid Temperature	Degrees F	40 to 80
Fluid pH Range		5 to 7
Fluid Specific Gravity		1.0
Project Site Elevation	Feet	2,072

3. The Contractor shall ensure the pump vendor examines the site conditions, intended application, and operation of the pump system and recommend the pump which will best satisfy the indicated requirements.

2.2 MATERIALS OF CONSTRUCTION

A. Unless otherwise specified elsewhere, all non-clog submersible chopper pumps shall be constructed of the following materials:

Item	Material	Construction
Pump Casing	Casing and motor housing shall be close-grain cast iron conforming to ASTM A-48 Class 30 standards.	Casing shall form the volute and shall be a single piece with smooth flow passages. The casing shall have a centerline discharge to allow guide rails.
Connections		Flanged discharge connections shall be 4-inch and conform to the requirements of ANSI B16.1, class 125.
Impeller	Impeller shall be constructed of ductile iron, ASTM A-536, case hardened to minimum Rockwell C60 and shall be dynamically balanced.	The pump impeller shall be an enclosed type, dual vane, with sharpened edges incorporated into the rear shroud to prevent fouling behind the impeller. Primary chopping/conditioning of materials shall be accomplished by the action of the sharpened leading edges of the impeller blades moving across the slicing plate at the intake openings with a set clearance between the impeller and slicing plate of .03” to .010”.

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Slicer Plate	440C stainless steel, heat treated to 53-60 HRC, with hole pattern to accommodate 4-inch 125 lb. flange	The surface of the suction plate shall be recessed into the pump bowl and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.03-0.010" of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area.
Slicing Blade	440C stainless steel, heat treated to 53-60 HRC.	The area behind the impeller shall be protected from fouling by the cutting and expulsion action of the serrated and sharpened teeth or sharpened vane edges in the rear of the impeller shroud, sweeping across the spiral grooves in the casing backplate.
Shaft	The motor/pump shaft shall be one piece and shall be constructed of 416 stainless steel.	The shaft shall be totally isolated from the liquid being pumped. The shaft shall have a maximum deflection at the lower seal of .002 inches. No coupling between the motor and the impeller shall be required
Bearings		The upper bearing shall be a radial single row ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for thrust and radial forces. All bearings shall be rated for a minimum L 10 life of 100,000 hours at 25% of the flow at the best efficiency point (BEP). Bearings shall be permanently lubricated with a premium moisture resistant grease or ISO grade 46 turbine oil containing rust inhibitors and shall be suitable for operation over a temperature range of -25^0C to $+120^0$C. A mechanical seal shall be provided to isolate the bearings from the pumped media at 120^0C.

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Motor Shaft Seals	The lower seal faces shall be silicon carbide versus silicon carbide. The upper mechanical seal shall be constructed of a carbon rotating face and a ceramic stationary face. All other seal components shall be 304 SS. Mechanical seals shall be readily and commercially available from third party sources or readily available from the pump and motor manufacturer.	Two independent, tandem mounted, mechanical face type seals shall be provided to isolate and protect the air-filled motor from the pumped media. The inner and outer seal shall be separated by an oil filled chamber. The oil chamber shall act as a barrier to trap moisture and provide sufficient time for a planned shutdown. Type 21 mechanical seals shall be used for commercial availability
Oil Chamber		To supply oil for lubrication and cooling of the shaft seals. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the Side of the pump. A dual probe leak detector shall me submerged in the oil bath and communicate to the moisture relay mounted in the control panel.
Pump Base		The discharge base and elbow shall be installed in the bottom of the anoxic basin and the pump shall be connected to the discharge elbow by a downward motion of the pump as it is lowered into the wet well on a guide rail system. Sealing of the pump and discharge elbow shall be by use of a profile gasket mechanically held in place between the pump and the base. The guide rail bracket shall have a standard ANSI flange for connection of the pump.
Cables		The cable entry fitting shall be with a simple plug & play connection with a single cable. The cable shall be able to control the voltage of the pump without user intervention. The rubber plug shall be torqued to make a complete seal between the motor & cable connections.
Lifting Device		Type 316 stainless steel guide rails with brackets and a stainless-steel guide cable lifting assembly of sufficient operating length with hooks and tension device, all rated at least five (5) times the weight of the pump and motor.
Fasteners	Type 316 stainless steel	All exposed fasteners

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2.3 GUIDE BRACKET AND RAIL SYSEM

A. Provide dual 316 SS guide rails, extending from the base to the top of the wet well, and breakaway fitting with cast iron base elbow to provide for removal of the pump by lifting the pump without entering the wet well. The guide rail system shall be non-sparking.

B. Each pump shall be furnished with a stainless-steel bracket permanently mounted to the top of the pump, with a large loop for accommodating a lift hook. Each pump shall be fitted with a stainless-steel lifting chain or lifting cable of adequate length. The working load of the lifting system shall be 50% greater than the pump unit weight.

C. The guide rail system shall include a sliding guide bracket that allows removal of the pump without binding, and properly aligns the pump to automatically seat with the pump discharge connection. Each pump shall have permanently installed cast iron discharge elbow that seats against the pump discharge connection.

2.4 ELECTRICAL REQUIREMENTS

A. Pump Controls

1. Owner’s system integrator to provide motor starter for each pump. The motor starter shall include H-O-A selector switch and I/O to the PLC (in the LCP cabinet provided by the Owner's system integrator) that will provide the control capabilities specified in Section 40 61 96 – Control Strategies. In addition, outputs to PLC shall include hour meter and alarm lights for moisture switches, thermal switches, and pump failure for each pump.

B. Motor: Pump motors shall be of explosion-proof design conforming to NFPA 820 requirements. In addition, pump motors shall conform to NEMA MG-1 Part 14.30 requirements and shall be a squirrel cage induction NEMA Design B electric motor conforming to the following requirements:

Item	Value
Installation Environment	Submersible, Oil Filled
Enclosure	Explosion Proof
Insulation Class	Explosion Proof
Insulation Class	NEMA Class H
Insulation	Non-Hygroscopic Polyester
Service Factor	1.15 Minimum
Synchronous Speed	1,800 RPM Maximum
Voltage	240
Phase	3
Frequency	60 Hz

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C. Moisture Sensor: Provide a dual probe sensing system to detect the presence of moisture within the motor. The moisture sensors shall be wired to the pump control system to provide seal failure protection indication for the pump. Provide a moisture detection relay for each pump suitable for connection to Supervisory Control and Data Acquisition (SCADA) network for detection of moisture in the seal chamber. The moisture detection relay shall be powered by 120-volt AC and shall close a set of contacts in the relay when moisture is present in the pump seal chamber.

D. Thermal Sensors: Thermal sensors shall be used to monitor stator temperatures by the use of three thermal switches embedded in the coils of the stator winding. The thermal sensors shall be wired to the pump control system to provide overheat protection for the motors and be connected to the SCADA network similar to moisture sensor.

E. Electric Cable: The power and control cable entry system shall be designed to provide a positive, leak-free seal to prevent liquid from entering the air-filled motor housing. The design shall incorporate provisions which prevent moisture from wicking through the cable assemble even in the event that the cable jacket has been punctured. All cable shall be type SEOW-A and U.L. listed for the intended submersible service.

F. The power and control cable entry into the lead connection chamber shall be encapsulated rubber puck sealing the motor connection. Compression type grommet fittings employed as the primary sealing system shall neither be considered equal or acceptable. Single power and control cables shall be provided.

G. The pump motor cable and control cable shall be UL listed or FM approved for use with motors for Class 1, Division 1, Group C & D Locations.

2.5 MANUFACTURER

A. Crane Co., Barnes Sithe X-Proof (Model 4XSCDF)

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt or dust, or other contaminants.

B. All part shall be properly lubricated and protected so that no damage or deterioration will occur even during a prolonged delay from the time of shipment until installation is completed and the pumps are ready for operation.

C. Finished ferrous surfaces not painted shall be properly protected to prevent rust and corrosion.

D. The finished surfaced of exposed flanges shall be protected by strong wooden blind flanges.

E. Each pump shall be properly crated to protect against damage during shipment.

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3.2 INSTALLATION

A. Install pump as shown in the drawings and as recommended by the pump manufacturer.

B. The Contractor shall ensure that anchor bolts are set only after the discharge piping has been properly installed, to ensure exact fit with embedded piping components.

3.3 SERVICES OF MANUFACTURER

A. Secure start-up service for the pump as specified below:

Schedule of Field Service Representative on Site Time		
Service	On Site Time (Days)	Trips to Site
Installation verification, start-up and instruction of the Owner's personnel	1	1

B. A "Day on Site" is defined as a conventional 8-hour workday excluding travel time. A "Trip to Site" is defined as complete round trip travel from the Manufacturer's factor. All expenses including salary, local/long distance travel, lodging, meals and any other per diem or miscellaneous expenses of the authorized service representative shall be the responsibility of the Contractor.

C. A factory representative of the pumping equipment shall be present to supervise start-up and ensure proper operation of all components. The Contractor shall obtain and pay for the factory representative start-up service.

D. A factory representative of the pumping equipment shall provide operations and maintenance training for the Owner's staff. The training shall include trouble shooting the normal problems, operations, and routine maintenance. The Contractor shall video the training and provide a copy to the Owner.

END OF SECTION 43 26 20

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APPENDIX A -
GEOTECHNICAL EVALUATION

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March 22, 2024
File: CD23039A

Mr. Kyle Meschko, P.E.
Keller Associates, Inc.
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
Via Email: kmeschko@kellerassociates.com

RE: **Geotechnical Engineering Evaluation**
Sandpoint Lift Stations
Sandpoint, Idaho

Greetings:

STRATA is pleased to provide this Geotechnical Engineering Evaluation for the Sandpoint Lift Stations project located in Sandpoint, Idaho. Our geotechnical engineering evaluation's purpose was to perform field exploration and laboratory testing and provide geotechnical engineering opinions and recommendations to assist project planning, design, and construction. We accomplished our geotechnical services referencing our authorized proposal dated May 18, 2023. This report was updated based on draft report review comments provided by Keller Associates, Inc. (Keller) in February and March of 2024.

The following report provides specific geotechnical information for earthwork, shallow foundation design, and lateral earth pressures. The geotechnical information presented herein must be read and understood in its entirety; portions or individual sections of our evaluation cannot be relied upon without the supporting text.

Our opinion is that construction success will depend, in part, upon the design team and contractor following our evaluation requirements, project plans, and specifications, the contractor adhering to good construction practices, and the Owner and/or contractor providing the required and necessary construction monitoring, testing, and geotechnical consultation to verify the work has been accomplished as required herein. Therefore, we recommend that STRATA be retained to provide monitoring, testing, and consultation services to verify our evaluation recommendations are followed.

We appreciate the opportunity to assist Keller and the City of Sandpoint (City) with this project and look forward to our continued involvement during the construction phase. Please contact us if you have any questions or comments.

Sincerely,
STRATA

PROFESSIONAL ENGINEER LICENSED Ryan Lewis 17107 03-22-2024 STATE OF IDAHO RYAN M. LEWIS

Steven J. Litalien, E.I.
Staff Engineer

Luke R. Michels, P.E.
Engineering Services Manager

Ryan M. Lewis, P.E.
Senior Engineer

SJL/LRM/RML/rl

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STRATA

Geotechnical Engineering Evaluation

Sandpoint Lift Stations
Sandpoint, Idaho

March 22, 2024

Prepared for:
Mr. Kyle Meschko, P.E.
Keller Associates, Inc.
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814

Prepared by:
STRATA
1016 W. Hayden Ave
Hayden, Idaho 83835
Telephone (208) 772-2428

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Geotechnical Engineering Evaluation
Sandpoint Lift Stations
Sandpoint, Idaho

INTRODUCTION

STRATA performed our services referencing our authorized proposal dated May 18, 2023:

1. Coordinated with Keller and the City to delineate exploration schedules, locations, utility issues, cleanup expectations, site access issues, and other exploration-specific considerations.
2. Conducted a site visit to establish and mark proposed exploration locations prior to public utility locating.
3. Contacted the North Idaho 811 utility notification center prior to exploration to identify known public utilities within 50 feet of proposed boring locations (required by Idaho state law).
4. Subcontracted a trailer-mounted drill rig and operator to advance two exploratory borings to 41.5 feet below the ground surface. We advanced one boring at the Superior Street site and one boring at the beach site. We obtained Standard Penetration Test (SPT) soil samples at 2.5- to 5.0-foot intervals, extending to each boring's termination depth. Additionally, we collected relatively undisturbed Shelby tube samples at select locations.
5. Logged the subsurface profiles, visually described, and classified the soil encountered referencing the *Unified Soil Classification System* (USCS). We staked/painted and labeled each location following drilling to assist future surveying. Additionally, we documented exploration locations using a commercially available global positioning system (GPS) device.
6. Accomplished laboratory testing on samples obtained during fieldwork referencing *ASTM International* test standards. Laboratory test results were used to assist soil classification and characterize soil engineering parameters. Laboratory testing included:
    - Grain size evaluations
    - In-place moisture content
    - Atterberg limits
    - Unconfined compressive strength (soil)
    - pH/resistivity/sulfate content
    - One-Dimensional Consolidation
    - Direct Shear
    - Triaxial Shear (Unconsolidated Undrained)
7. Reviewed the team's design development documents to provide geotechnical design and construction recommendations for:
    - Earthwork
    - Shallow foundation design
    - Lateral Earth Pressures
    - Additional recommended services
8. Prepared a draft geotechnical report, including exploration logs, laboratory test results, and related visual aids.
9. Issued this stamped report deliverable after reviewing substantially complete design information and incorporating draft report review comments.

PROJECT UNDERSTANDING

Keller Associates, Inc. (Keller) has been selected to provide civil and structural design services for improvements to the City of Sandpoint (City) wastewater system that includes the construction of two new wet wells. You have requested STRATA provide geotechnical design recommendations for the project to assist civil and structural design. We base our project understanding on our telephone and electronic mail conversations with Kyle Meschko, P.E. with Keller as well as our previous experience with similar subsurface conditions near the project site.

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Site Conditions

The proposed lift station upgrade sites are located on either side of the mouth of Sand Creek; reference Plate 1, *Site Location Plan*.

One lift station is located in a landscaped grass swale section of the Sandpoint City Beach parking lot, approximately 250 feet east of the U.S. Highway 95 and railroad overpasses (beach site). The proposed beach site lift station site is located at the southern end of the narrow peninsula formed at the confluence of Sand Creek, Pend Oreille River, and Lake Pend Oreille. The area surrounding the landscaped proposed wet well location is developed, with the paved Sandpoint City Beach parking lot immediately to the east, and the City of Sandpoint RV Park immediately to the west. The area surrounding the proposed wet well is relatively flat, with less than 5 feet of elevation loss over 500-foot distance in all directions.

The other lift station will be located approximately 300 feet east of the intersection of East Superior Street and South 1st Avenue, adjacent to an existing lift station structure (Superior site). The proposed Superior site lift station location is approximately 30 feet south of East Superior Street in a currently undeveloped lot between the Riverside Building parking lot to the east and the Eye Clinic of Sandpoint office building parking lot to the west. The undeveloped lot to the south is moderately vegetated with grass and shrubs. The area surrounding the proposed wet well is relatively flat, with less than 2 feet of elevation loss over 500-foot distance in all directions.

Proposed Construction

Proposed construction will include the installation of a new wet well at each site and associated yard piping. The proposed wells will both be approximately 8-foot diameter concrete wet wells bearing on a 10.5-foot square base. The beach site wet well will bear approximately 15 feet below grade and weigh up to 97,000 pounds when full of wastewater. The Superior site wet well will bear approximately 16 feet below grade and weigh up to 105,000 pounds when full of wastewater. The project will also include valve vaults and equipment pads. The footing design for the wet wells will need to resist buoyancy uplift forces caused by shallow groundwater when the tank is empty.

FIELD AND LABORATORY EVALUATION

Field Exploration

We evaluated subsurface conditions by advancing one exploratory boring at each wet well site (B-1 & B-2) on November 21, 2023. Plates 2 and 3 illustrate the approximate boring locations documented in the field with a commercially available GPS unit.

We advanced borings at both sites to 41.5 feet below the existing ground surface using a trailer-mounted G-2400 drill rig equipped with 7-inch outside-diameter, hollow-stem augers. We obtained soil samples within the undocumented fill and native soil at 2.5- to 5.0-foot intervals via standard penetration testing (SPT) using 2-inch-diameter split spoon samplers. We advanced the SPT samplers 18 inches with a 140-pound hammer falling 30 inches. We obtained the SPT N-value by counting the number of hammer blows required to advance the sampler

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over the interval from 6 to 18 inches. The blow counts for each 6-inch sampler segment are presented on the boring logs. The SPT N-values reported on the boring logs are raw, uncorrected values. We also obtained relatively undisturbed Shelby tube samples at select locations and bulk samples from auger cuttings.

Mr. Steven Litalien, E.I. visually described, classified, and logged the subsurface conditions encountered during exploration referencing the USCS. Appendix A presents exploration logs and a USCS explanation for soil description, which should be used to help interpret terms used throughout this report and on the exploration logs.

Following exploration completion, we loosely backfilled borings with a combination of bentonite and on-site cuttings finished approximately level with the surrounding ground surface. STRATA staked the boring locations prior to departing the site.

Subsurface Conditions

General

At both the Superior site (B-1) and the Beach site (B-2), we generally encountered surficial imported topsoil over undocumented fill underlain by native clay that extended to each boring's termination depth. The undocumented fill encountered at the Superior site, which classified as a sandy silt (ML) and extended to 6.5 feet below the existing ground surface (BGS), is likely associated with prior development or utility placement. The undocumented fill encountered at the beach site comprised wood chips that extended to 7.5 feet BGS.

Bedrock was not encountered during exploration and is not expected to be encountered during construction of the new wet wells. Groundwater was encountered within the upper 5 feet of the soil profile at both sites at the time of exploration.

Topsoil

We encountered 0.8 feet of topsoil at the Superior site and 1.7 feet of topsoil at the beach site. The topsoil visually classified as either clayey sand (SC) or sandy lean clay (CL) according to ASTM D2488 and was described as light to dark brown and moist, with an in-situ moisture content of 26.2 percent. The topsoil contained grass, roots, and organic material.

Undocumented Fill – Superior Site

Below the topsoil layer at B-1, we encountered undocumented fill that extended to 6.5 feet BGS and classified as sandy silt (ML). The fill was brown and moist to wet with an in-situ moisture content of 13.6 percent above the groundwater table. Penetration resistance values in the fill were 1 to 5 blows per foot, indicating a very soft to firm soil stratum. The fill had a fines content (percent passing the No. 200 sieve) of 52.9 percent. Atterberg limits testing indicated that the fill has a liquid limit of 21 percent and a plasticity index of 0. Wood chips and gravel were encountered throughout the fill layer at the Superior site.

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Undocumented Fill – Sandpoint City Beach Site

Below the topsoil layer at B-2, we encountered undocumented fill consisting of wood chips that extended to 7.5 feet BGS. No discernable soil was encountered in the wood chip fill layer. Groundwater was encountered in the wood chip fill layer, resulting in a strong odor described as decaying organic material.

Native Clay

Below the undocumented fill we encountered native clay that classified as either lean clay (CL) or fat clay (CH) according to ASTM D2487 that extended to the termination depths of both borings (41.5 feet BGS). The clay was gray and wet with an in-situ moisture content ranging from 25.3 to 49.8 percent. Penetration resistance values in the clay fill were 0 to 7 blows per foot, indicating a very soft to firm soil stratum. The clay had a fines content ranging from 86.0 to 100.0 percent. Atterberg limits testing indicated that the native clay has a liquid limit ranging from 42 to 54 percent and plasticity indices ranging from 18 to 30. Thin seams of silty sand were observed interbedded throughout the native clay layer in B-1.

Groundwater

Groundwater was encountered in boring B-1 at 5.0 feet BGS and encountered in B-2 at 2.0 feet BGS. Groundwater can vary with seasonal changes in irrigation, infiltration, precipitation, and adjacent site developments. We recommend that designers assume the groundwater table will match the existing ground surface elevation throughout the rainy season.

Subsurface Variability

Exploratory borings only allow observation of a relatively small sample of the subsurface conditions at the site. Variations may exist beyond and below exploration locations. Such variations will not be apparent until construction and may impact project schedules and costs. Where such variations exist, it may affect the opinions and recommendations presented in this report as well as construction timing and costs and we must be contacted to review the encountered conditions and our recommendations to make any necessary revisions.

Laboratory Testing

We performed laboratory testing on select soil samples collected in the field referencing *ASTM International* (ASTM) test standards. We used laboratory test results to verify soil classification and to estimate soil engineering properties. Laboratory testing included grain size evaluations, Atterberg limits, in-situ moisture contents, pH/resistivity/sulfate content, direct shear, triaxial shear (UU), unconfined compression, and one-dimensional consolidation testing. Index laboratory test results are presented on exploratory logs in Appendix A. Graphical test results are provided in Appendix B.

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GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

We present the following geotechnical recommendations to assist project planning, design, and construction for the Sandpoint Lift Stations project planned in Sandpoint, Idaho. We based our geotechnical recommendations on our experience with similar soil and geologic conditions, findings from our field and laboratory evaluation, geotechnical engineering analyses, and our understanding of the proposed construction. If development plans change, we should be contacted to review the project modifications and revise our recommendations as necessary.

General Project Considerations Discussion

Based on our field and laboratory evaluation, our opinion is both project sites are suitable for the proposed wet well structures, provided our recommendations are incorporated into project plans and specifications, and are followed and verified during construction. Based on the elevations provided by Keller, we recommend that the wet well floors bear on a layer of *Crushed Aggregate Base* placed and compacted on the native clay.

Earthwork

Site and Subgrade Preparation

We anticipated all topsoil, undocumented fill, and wood chips will be removed from the wet well footprint prior to *Crushed Aggregate Base* placement. However, if encountered at the planned wet well bearing elevation, we recommend topsoil, defined as soil containing greater than 3 percent vegetation and organics by weight (per ASTM D2974), and undocumented fill be removed prior to placement of the *Crushed Aggregate Base* layer. We encountered 0.8 feet of remnant topsoil underlain by undocumented fill extending to 6.5 feet BGS at the Superior site. We encountered 1.7 feet of remnant topsoil underlain by undocumented fill extending to 7.5 feet BGS at the Beach site. The undocumented fill in boring B-1 had inconsistent penetration resistance values and the undocumented fill comprised of wood chips in boring B-1 are highly deleterious, both of which could lead to excessive total or differential settlement under the weight of new structures over time.

Following topsoil stripping and undocumented fill removal, we recommend the contractor excavate to subgrade soil elevation within the native clay using smooth blade equipment. It is the contractor's responsibility to keep topsoil, undocumented fill, wood chips, and native soil separated while excavating soil from the new wet well footprint. We recommend the bottom of the wet wells, valve vaults, and equipment pads bear on a minimum 12-inches of *Crushed Aggregate Base* placed and compacted over the native clay. A non-woven separation fabric should be placed between the native clay subgrade and the imported *Crushed Aggregate Base* layer.

Excavation Characteristics

Temporary Excavations

We anticipate native site soil and undocumented fill may be excavated using conventional excavation techniques. In general, slopes and excavations must be excavated, shored and/or braced in accordance with the *Occupational*

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Safety and Health Administration (OSHA) regulations and local codes. The on-site soil is generally classified as a "C" type soil according to OSHA requirements. As such, we recommend provisions be made to allow temporary excavations of any type, and soil to be sloped back to at least 1.5H:1V (horizontal to vertical) or as otherwise determined to be safe according to the selected contractor's competent person.

Excavations must be planned carefully, allowing water collection points and utilizing conventional sumps and pumps to remove nuisance water from runoff, precipitation or groundwater seeps. **We recommend project specifications require a detailed and comprehensive dewatering plan for construction of the new wet wells. This plan should address any potential negative impacts to adjacent structures during dewatering.** Additionally, site runoff should be directed away from temporary excavation slopes by grading, berms, or other devices.

If soil excavations are not immediately backfilled, they may degrade when exposed to water and require overexcavation and replacement with *Crushed Aggregate Base*. We recommend construction activities and excavation backfilling be performed as rapidly as possible to reduce the potential for subgrades to degrade under construction traffic.

Shoring Plan Considerations

Although not currently planned, if excavation depths exceed a total of 20 vertical feet, in accordance with OSHA requirements, we recommend project excavations be designed by an engineer licensed in the State of Idaho. Furthermore, project value is augmented when bidding contractors are allowed flexibility in the type and nature of shoring or excavations, such that they can use their experience, means, methods, equipment, and materials familiar to them when considering bids.

We remain available to consult with the project team and help develop contract documents that consider shoring and excavation constraints against geotechnical characteristics, including the soil conditions encountered. Ultimately, our opinion is construction success is improved by clearly delineating the overall project requirements, limitations, and site conditions, while simultaneously allowing the selected contractor the flexibility to apply their experience toward a safe and efficient project, and assuming the responsibility thereof.

<u>Soil Product Specifications and Required Compaction</u>

Soil Products and Re-use

We recommend the support aggregate layer placed below the new wet wells comprise *Crushed Aggregate Base* meeting the requirements presented in Table 1. The on-site native clay and the silt undocumented fill at the Superior site may be used as *Backfill* for the wet wells provided it can be dried to within 3 percent of optimum moisture content. We anticipate that the native clay will be well above optimum moisture and may be difficult to moisture condition and re-use on-site. The undocumented fill comprised of wood chips at the Beach site is not suitable for reuse as *Backfill*.

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Table 1. Soil Specifications and Allowable Use

Soil Fill Product	Allowable Use	Material Specifications
Backfill[1]	• Wet well wall and structure backfill • Utility trench backfill above bedding course for underground pipe	Soil must be classified as GP, GM, GW, SP, SM, SW, ML, CL, or CH according to the USCS. Must have a compacted wet density of at least 109 pcf. Soil may not contain particles larger than 12 inches in median diameter. Soil may not contain particles larger than 6 inches in median diameter within 2 vertical and horizontal feet of concrete footings, concrete walls, or pipes. Soil must contain less than 3 percent organics and vegetation by weight (per ASTM D2974). Soil must contain less than 3 percent wood, metal, plastic, or other deleterious substances (quantity can be approximated by the geotechnical engineer-of-record).
Crushed Aggregate Base	• Wet well, valve vault, and equipment pad base support aggregate • Backfill uses	Must meet ¾-in. "Type I" aggregate gradation requirements specified in Table 1 from *Section 802.2.2 – Crushed Aggregate for Base Gradation* of ISPWC Standards.[2] ***OR*** "3/4-inch B" nominal maximum size aggregate gradation requirement specified in Table 703.04-1 from *Section 703 – Aggregates* of ITD SSHC.[3]
Pipe Bedding Course	• Utility pipe bedding	Must meet "Type I", "Type II" or "Type III" bedding material specified in Section 305 – Pipe Bedding of ISPWC Standards[2].
Unsatisfactory Soil	• **NONE**	Soil classified as OH, OL or PT may not be used at the project site. Any soil type not maintaining moisture contents within 3 percent of optimum during compaction is unsatisfactory soil.[4] Any soil containing more than 3 percent (by weight) of organics, vegetation, wood, metal, plastic or other deleterious substances.

1. The on-site silt undocumented fill and native clay within the planned construction depths generally meets the intent of our recommendations for *Backfill* provided it can be dried to within 3 percent of optimum moisture.
2. The 2020 version of *Idaho Standards for Public Works Construction* (ISPWC).
3. The 2023 version of *Idaho Transportation Department (ITD) Standard Specifications for Highway Construction (SSHC)*
4. Unsatisfactory soil that is wetted or dried to within 3 percent of optimum moisture may be used as *Backfill*, providing other criteria are met for appropriate *Backfill* use per Table 1 above.

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Compaction

Table 2 summarizes soil product compaction requirements in designated project areas.

Table 2. Required Soil Products for Designated Project Areas

Project Area	Required Soil Product	Compaction Requirement[1]
Directly beneath base of wet well	*Crushed Aggregate Base*	95%
Wet well and utility trench backfill above pipe bedding	*Backfill*	95%
Over-excavations caused by wet weather and/or wet soil conditions	*Crushed Aggregate Base*	95%

1. Reference ASTM D1557 (modified Proctor) or American Association of State Highway and Transportation Officials (AASHTO) T180 for coarse grained soil and ASTM D698 or AASHTO T99 for fine grained soil.

Place soil products over approved subgrades. Never place soil products over frozen, saturated, or soft subgrades. Soil products must be moisture conditioned to within 3 percent of the optimum moisture content and placed in maximum 12-inch-thick, loose lifts. The contractor is responsible for selecting compaction equipment suitable for achieving compaction. If the contractor is unable to achieve the specified compaction requirements listed in Table 2 using the selected compaction equipment, a lift thickness reduction may be required.

Coarse Soil Conditions

ISPWC recommends soil containing more than about 10 percent retained on the ¾-inch sieve be compacted according to Idaho IT-74, *Idaho Standard Method of Test for Vibratory Spring-Load Compaction for Coarse Granular Material*.

Alternatively, we recommend on-site or imported soil products that contain more than 30 percent particles retained on the ¾-inch sieve be compacted using a "method specification" specified as follows. Method compaction should occur by applying at least 5 complete passes over the soil surface using vibratory compaction equipment with a drum energy rating of at least 10 tons. We do not recommend smaller compaction equipment (i.e. jumping jacks, plate whackers, etc.) for method compaction. Method compaction should be observed on a full-time basis by STRATA and should achieve a firm, unyielding, and interlocking soil surface. Method compaction methods cannot be used if STRATA is not the firm selected to provide construction materials testing continuity services during construction.

<u>Wet Weather, Wet Soil Construction and Over-excavations</u>

We strongly recommend earthwork construction take place during dry weather conditions. In soft or wet soil areas and during wet weather conditions, earthwork contractors must be familiar with the hazards of using rubber-tired equipment, which exerts a point load on the subgrade. Staggering wheel paths, using tracked equipment to traverse

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exposed subgrades and other techniques are important processes that reduce the potential for subgrade pumping, rutting, and contractor rework.

Earthwork should not be performed immediately after rainfall, or until soil can dry sufficiently to allow construction traffic without disturbing the subgrade. Potential disturbance and the moisture-sensitive soil at the project site will likely require isolated removal and replacement during construction. We recommend any soil exhibiting pumping, rutting, weaving, or otherwise exhibiting unstable performance be moisture-conditioned to within 3 percent of the optimum moisture content and recompacted to *Backfill* requirements, or removed. If moisture-conditioning is impractical or may create project delays, the soil should be removed to undisturbed native soil using smooth-blade equipment and *Crushed Aggregate Base* placed to desired grades. We recommend the "over-excavation" process occur as follows:

1. STRATA and/or the selected contractor should identify and delineate unstable subgrade soil conditions. STRATA must review the affected area and provide the contractor and Keller feedback to help facilitate the over-excavation process.
2. After attempting proper moisture conditioning, remove unstable areas using smooth-blade equipment to a minimum depth of 1.0 foot below the subgrade surface. Extend the over-excavation a minimum of 2.0 feet laterally beyond the delineated unstable area.
3. STRATA shall verify the over-excavation base consists of undisturbed native soil or documented fill that has met minimum compaction testing requirements during placement.
4. A geotextile fabric should be placed over the verified over-excavation base to assist soil stabilization efforts. Refer to this report's *Geotextile Applications* section for additional information.
5. Place *Crushed Aggregate Base* in the over-excavation to desired grades in accordance with the *Soil Product Specifications and Required Compaction* report section.

In some instances, a 1.0-foot-deep over-excavation may not be sufficient to expose suitable native soil; additional over-excavation depth may be needed. Further, a nonwoven geotextile fabric should be used to assist remediation. We recommend STRATA be present to observe all over-excavations to verify they have been constructed according to the above criteria, but also to provide immediate on-site feedback and discussion with the project team regarding soft soil conditions to help facilitate the construction schedule.

Site Grading and Drainage

Any runoff from precipitation or snowmelt must be routed away from the new wet well structures to the maximum extent practical and must not be allowed to infiltrate or be diverted towards existing structures. Runoff or water migrating along the ground surface must be conveyed away from structures by an appropriately designed series of ditches, swales or other surface water management procedures.

We recommend the ground surface outside of any structure be sloped a minimum of 5 percent away for a minimum of 10 feet to rapidly convey surface water or roof runoff away from structures. Stormwater should be routed away from structures and should be disposed of in a suitable location greater than 20 feet from structures and in a suitable location as determined by the civil engineer.

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Based on the high groundwater table encountered during exploration, foundation drains will not be effective and should be omitted for this project.

Geotextile Applications

A nonwoven geotextile should be placed between the native clay and the *Crushed Aggregate Base* below the wet wells. Geotextiles should meet requirements outlined in the subgrade separation geotextile property requirements provided in *Section 2050 – Construction Geotextiles* of the ISPWC.

Geotextiles shall be applied directly on approved subgrade, taut, overlapped at least 18 inches or otherwise placed according to manufacturers' recommendations. Geotextile fabric must completely separate native soil from *Crushed Aggregate Base*. STRATA should be consulted to review geotextile applications, soil reinforcement methods, or other subgrade improvement alternatives during construction.

Geotextile fabrics may be useful in situations with soft, pumping, and rutting subgrade soil conditions but cannot be used to reduce or eliminate the risk of undocumented fill settlement associated with fill compression/consolidation or debris decay.

Foundation Design

General Requirements

If our recommendations are followed, the foundation design criteria presented herein can be applied to the wet well bases, assuming the loading conditions and elevations stated in our *Project Understanding* report section are accurate.

Wet Well Base Design

We recommend the wet well bases bear on a minimum 12-inches of compacted *Crushed Aggregate Base* as discussed in this report's *Earthwork* section. We recommend *Crushed Aggregate Base* subgrades remain in a compacted condition during wet well base preparations and placement.

Based on the structural loads provided by Keller bearing on a 10.5-foot square concrete base buried approximately 15 (Beach site) to 16 (Superior site) feet deep, we estimate the increase in effective stress below the wet well bases will range from approximately 400 (Superior site) to 600 (Beach site) pounds per square foot (psf) after accounting for the estimated volume of soil that will be replaced by the 8-foot diameter wet wells.

Based on the soil conditions anticipated at the base of the wet well, we recommend a maximum *total* allowable soil bearing pressure of 2,250 psf. This provided *total* allowable soil bearing pressure includes the weight of any soil backfill on the wet well floors and does **not** include reductions in pressure or backfill unit weight from buoyancy (i.e. this is not an *effective* bearing pressure). Based on our analysis, the provided loads, and provided base dimensions, we estimate less than 1-inch of total settlement from the planned effective stress increases at each wet well site.

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The structural design team should size the wet well floors to account for uplift forces from shallow groundwater, which was approximately 2 to 5 feet below the ground surface during exploration, but may match the ground surface seasonally. The larger the footprint of the wet well floor, the more the structural design team can rely on the weight of soil resisting uplift. The skin friction generated between the wet well backfill soil and smooth pre-cast structure will not resist uplift when the wet well base is wider than the wet well. As such, we do not recommend the structural design team rely on skin friction acting between the wet well walls and backfill soil to prevent wet well uplift caused by groundwater. To resist uplift, we recommend that the designer assume an *effective* unit weight of 46.6 pounds per cubic foot (pcf) for the wet well backfill. For calculating uplift pressure acting on the wet well bases, we recommend the designer use an uplift pressure of 62.4 psf per foot of depth below the ground surface (assume the groundwater may seasonally extend to the ground surface).

If the wet well dimensions, loads, or bearing elevations change, we should be contacted to re-evaluate settlement.

Corrosivity

Based on laboratory test results, the soil at the Superior site maintains a slightly acidic pH (6.79 to 6.88) and has high potential for corrosivity (resistivity = 2,810 to 3,930 ohms-cm). Sulfate content testing (12.7 to 30.8 mg/kg dry) indicated a negligible capacity for sulfate attach on concrete at the Superior site.

Based on laboratory test results, the soil at the Beach site maintains an acidic pH (6.26) and has high corrosivity (resistivity = 1,860 ohms-cm). Sulfate content testing (8.83 mg/kg dry) indicated a negligible capacity for sulfate attach on concrete at the Beach site.

We recommend all foundations and utility conduits have appropriate corrosion protection and the design team adhere to all code-minimum steel reinforcement clearances. We recommend a qualified corrosion engineer review the above test data to determine the appropriate protection measures needed at the site for the proposed structures.

Seismicity

STRATA utilized site soil and geologic data, the project location, the *2018 International Building Code* (IBC), the *National Earthquake Hazards Reduction Program* (NEHRP), and Chapter 20 of the *American Society of Civil Engineers* (ASCE) 7-16 to establish a Seismic Site Classification of “E” at the project site. We recommend seismic design reference the seismic parameters provided in Table 3 based on the soil conditions and project location. The risk-targeted maximum considered earthquake (MCE_R) spectral response acceleration parameters provided in Table 3, column 4 have been modified from a Site Class B to a Site Class E. The design spectral acceleration parameters provided in Table 3, column 5 are equal to 2/3 the Risk Targeted MCE_R acceleration parameters.

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Table 3. Seismic Response Criteria (ASCE 7-16)[1,2,3]

Period (seconds)	Standard Acceleration Coefficients for Site Class B (g)	Site Factor for Site Class E	MCE_R Spectral Acceleration Parameters for Site Class E (g)	Design Spectral Acceleration Parameters for Site Class E (g)
0.0 (Peak)	PGA = 0.150	F_{PGA} = 2.15	PGA_M = 0.322	-
0.2 (Short)	S_S = 0.334	F_a = 2.163	S_{MS} = 0.724 (F_a*S_S)	S_{DS} = 0.482 (⅔ S_{MS})
1.0	S_1 = 0.113	F_v = 4.2	S_{M1} = 0.473 (F_v*S_1)	S_{D1} = 0.315 (⅔ S_{M1})

1. Values for location Latitude 48.27201040° and Longitude -116.54605467°.
2. Acceleration coefficients based on 2% probability of exceedance in 50 years.
3. Values for an IBC occupancy category II (other hazard).

Lateral Earth Pressures

The wet well walls should be structurally designed to resist lateral earth pressures from the retained soil and groundwater as well as any surcharges from equipment, slopes, or vehicles adjacent to the walls. We recommend lateral earth pressures for conventional wall systems be estimated using the following static equivalent fluid pressure (EFPs) from Table 4. The earth pressure provided in Table 4 is a nominal, **unfactored** value.

Table 4. Static Equivalent Fluid Pressures[1]

Rankine Lateral Earth Pressure Case	Equivalent Fluid Pressure (EFP)[2]
	Below Groundwater
At rest case (no wall movement)	100 pcf

1. Assumes on-site or imported soil meeting the *Backfill* requirements provided in Table 1. Assumes flat backslope and no surcharge loads from equipment adjacent to walls.
2. Assumes saturated conditions.

Lateral surcharge pressures due to equipment, slopes, storage loads, etc. have not been included in the above lateral earth pressure recommendations. The lateral earth pressure coefficient of 0.63, acting over the entire wall height could be used to estimate the lateral earth pressure induced on walls due to adjacent surcharge loads from equipment and the slope behind the structure. The above lateral earth pressure is **static** and does not include seismic induced lateral pressures.

ADDITIONAL RECOMMENDED SERVICES

The information contained in this report is based on our understanding of the planned construction, anticipated structural loads, structure dimensions, and bearing elevations. Changes in wet well elevations, structural loads, site geometry, and actual subsurface conditions can alter our opinions and design recommendations. Therefore,

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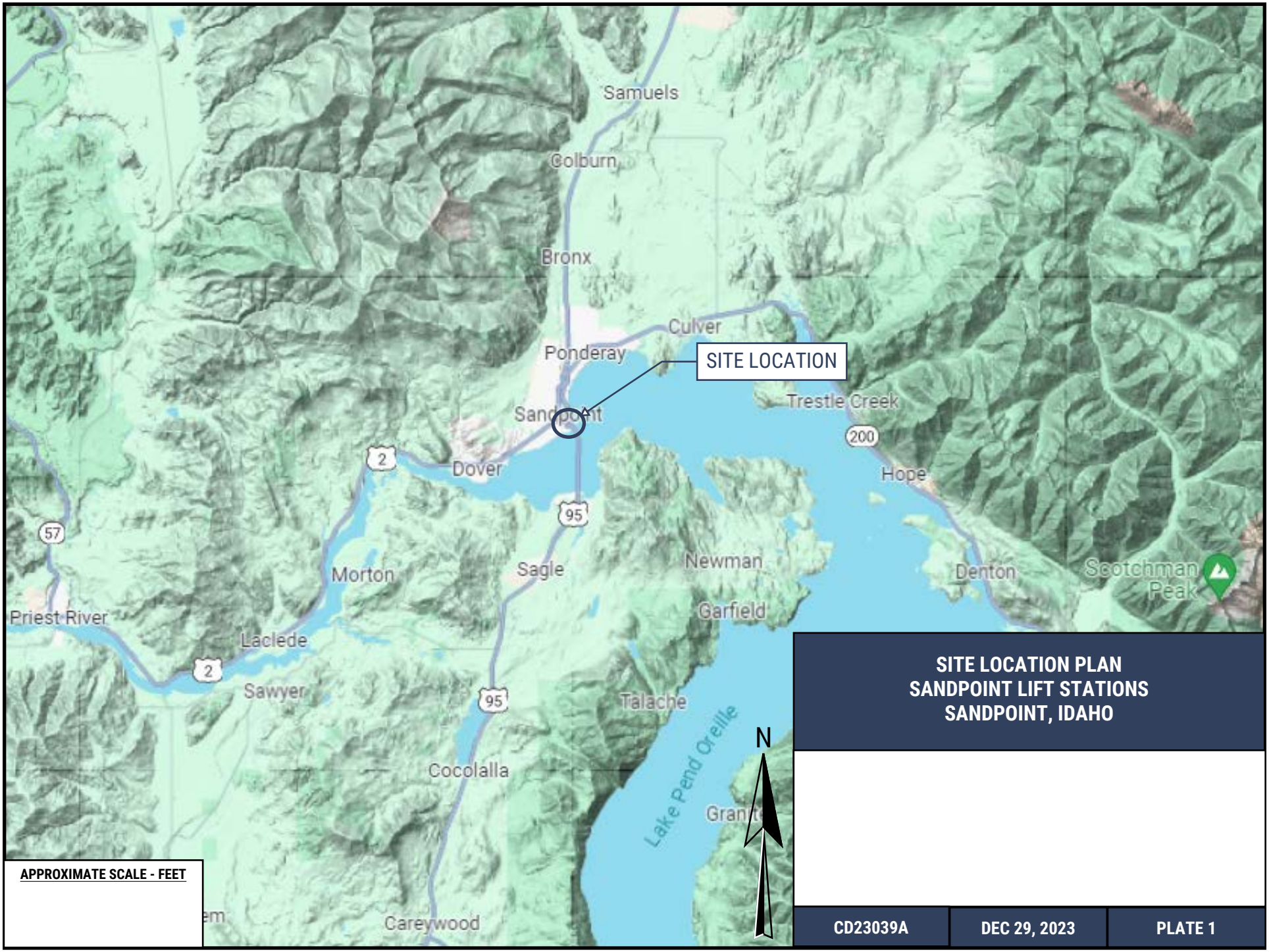
we recommend STRATA provide geotechnical continuity through final project planning and design as individual design aspects become available. We further recommend STRATA be retained to review the wet well design to verify our recommendations have been correctly interpreted. Further, verification of the subsurface conditions during construction is an important part of the geotechnical design process. We recommend you retain STRATA to be on-site during wet well subgrade preparations to verify the conditions encountered during exploration are exposed during construction and our recommendations are followed.

EVALUATION LIMITATIONS

This report has been prepared to assist project planning, design, and construction for the Sandpoint Lift Stations Project planned in Sandpoint, Idaho. Our geotechnical engineering evaluation did not include a site specific geohazard evaluation, liquefaction analysis, or lateral spreading analysis. Our services consist of professional opinions and recommendations provided in accordance with generally accepted geotechnical engineering principles and practices as they exist at this time, and in the area of this report. This report has been prepared specifically for this project and exclusively for the use of Keller Associates, Inc. and the City of Sandpoint. We do not authorize its use by firms other than the design team, as a reference document to support the design process. The geotechnical recommendations provided herein are based on the premise that STRATA will continue our project involvement to observe and document our recommendations are implemented during construction, and to confirm conditions between exploration locations. This acknowledgement is in lieu of any express or implied warranty.

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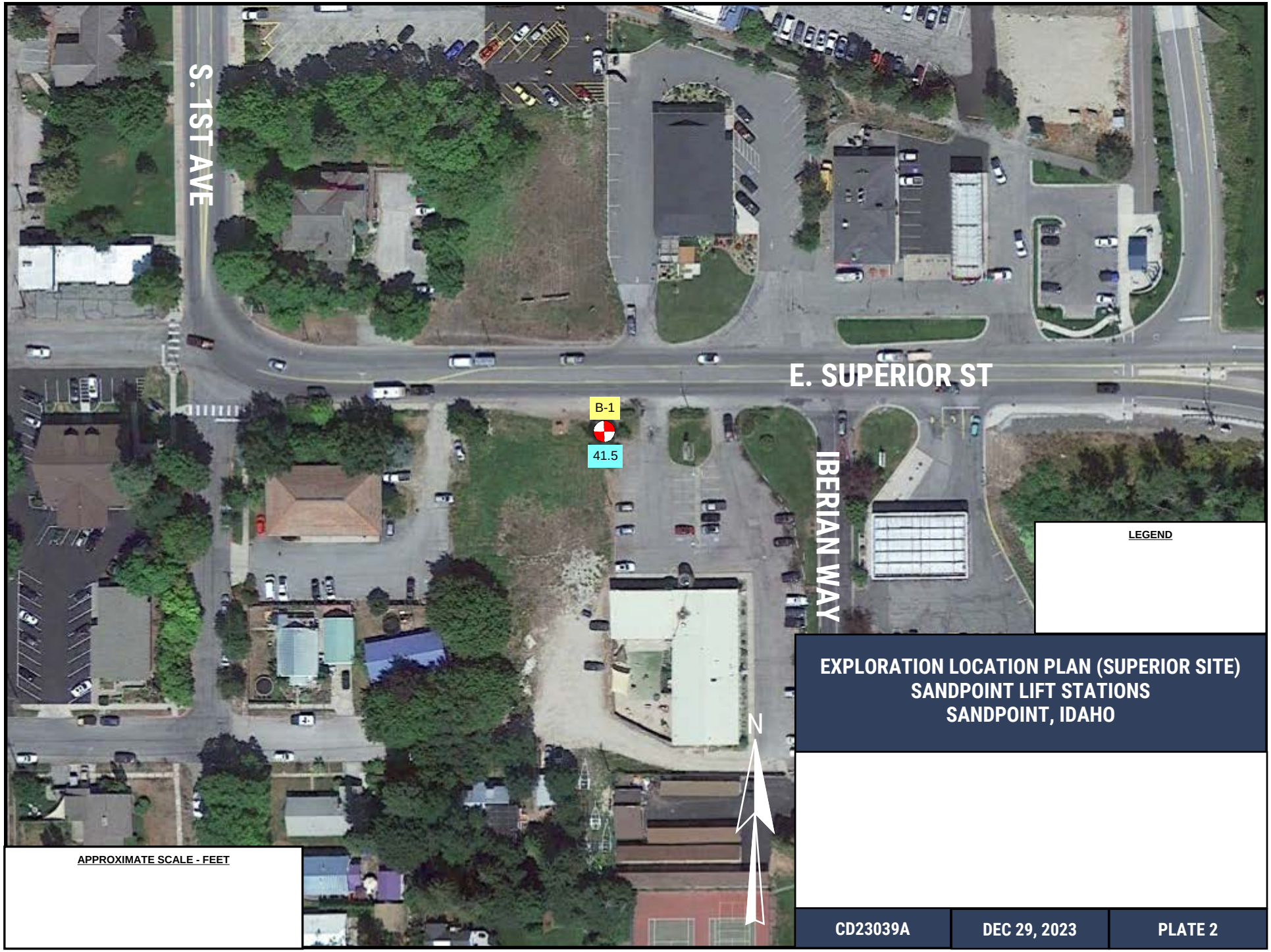
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SITE LOCATION PLAN
SANDPOINT LIFT STATIONS
SANDPOINT, IDAHO

CD23039A	DEC 29, 2023	PLATE 1

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EXPLORATION LOCATION PLAN (SUPERIOR SITE)
SANDPOINT LIFT STATIONS
SANDPOINT, IDAHO

CD23039A	DEC 29, 2023	PLATE 2

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0



LEGEND

APPROXIMATE SCALE - FEET

EXPLORATION LOCATION PLAN (BEACH SITE)
SANDPOINT LIFT STATIONS
SANDPOINT, IDAHO

CD23039A	DEC 29, 2023	PLATE 3

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Appendix A
Exploration Logs and USCS Explanation

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
COARSE GRAINED SOIL MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES
				GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH >12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SANDS >50% COARSE FRACTION PASSES #4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES		SW	WELL-GRADED SANDS, GRAVELY SANDS
				SP	POORLY GRADED SANDS, GRAVELY SANDS
		SANDS WITH >12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOIL 50% OR MORE PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	INORGANIC		ML	INORGANIC SILTS, SANDY OR CLAYEY SILTS
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAYS
		ORGANIC		OL	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE	INORGANIC		MH	INORGANIC SILTS, MICACEOUS SILTS, PLASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		ORGANIC		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOIL

SHORTHAND NOTATION

- SPT - STANDARD PENETRATION TEST
- PL - PLASTIC LIMIT
- LL - LIQUID LIMIT
- PI - PLASTICITY INDEX
- MC - MOISTURE CONTENT
- DD - DRY DENSITY
- WD - WET DENSITY
- UC - UNCONFINED COMPRESSION
- OC - ORGANIC CONTENT
- BGS - BELOW GROUND SURFACE
- N.E. - NOT ENCOUNTERED

MATERIAL DESCRIPTION CONTACT

——— DISTINCT SOIL LAYER CONTACT WITHIN SOIL PROFILE

- - - - - - APPROXIMATE SOIL LAYER CONTACT WITHIN SOIL PROFILE

NOTES

1. MIXED UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS ARE USED TO INDICATE DUAL SOIL CLASSIFICATIONS.
2. THE SPT N-VALUE, REPORTED IN BLOWS PER FOOT, IS THE SUM OF THE NUMBER OF BLOWS REQUIRED TO DRIVE THE STANDARD SPLIT SPOON SAMPLER A DISTANCE OF 12-INCHES AFTER AN INITIAL 6-INCHES OF PENETRATION. IF A TOTAL OF 50 BLOWS ARE INSUFFICIENT TO ADVANCE ANY OF THE THREE 6-INCH INTERVALS, THE PENETRATION DEPTH AFTER 50 BLOWS IS ALSO REPORTED.

BORING LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	STANDARD 2-INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER
	MODIFIED CALIFORNIA 3-INCH OUTSIDE DIAMETER SAMPLER
	ROCK CORE
	SHELBY TUBE 3-INCH OUTSIDE DIAMETER SAMPLER

ADDITIONAL MATERIAL SYMBOLS

GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
	AC	ASPHALT CONCRETE
	CC	PORTLAND CEMENT CONCRETE
	TS	TOPSOIL
	FL	FILL

TEST PIT LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
BG	BAGGIE SAMPLE
	BULK SAMPLE
RG	RING SAMPLE

GROUNDWATER SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	GROUNDWATER LEVEL AT TIME OF DRILLING
	GROUNDWATER LEVEL AT END OF DRILLING
	GROUNDWATER LEVEL 24 HOURS AFTER DRILLING COMPLETION
04-10-18	DATE OF GROUNDWATER READING

EXPLORATION LOG KEY - SOIL

STRATA

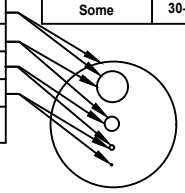
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GRAIN SIZE

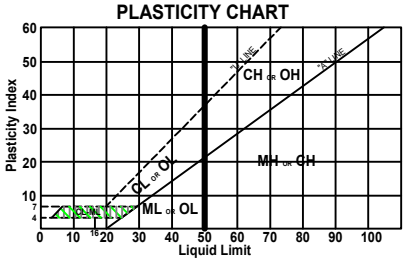
DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-size.
Cobbles		3" - 12"	3" - 12"	Fist-size to basketball-size.
Gravel	coarse	3/4" - 3"	3/4" - 3"	Thumb-sized to fist sized.
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized.
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized.
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized.
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized.
Fines		Passing #200	<0.0029"	Flour-sized and smaller.

MODIFIERS

DESCRIPTION	%
Trace	<5
Few	5-10
Little	15-25
Some	30-45



PLASTICITY CHART



STRATIFICATION

DESCRIPTION	THICKNESS
Parting	1/16 - 1/4"
Lense	1/4 - 4"
Layer	4 - 12"

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness.
Frequent	More than one per foot of thickness.

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to touch.
Moist	Slightly damp, some apparent moisture.
Wet	Saturated, visible free water, soil is below water table.

APPARENT RELATIVE DENSITY OF COARSE-GRAINED SOIL

APPARENT DENSITY	SPT blows/ft	CALIFORNIA SAMPLER blows/ft	D & M SAMPLER blows/ft	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	0-4	<4	<5	0-15	Easily penetrated with 1/2" reinforcing rod pushed by hand.
Loose	5-10	5-12	5-15	15-35	Difficult to penetrate with 1/2" reinforcing rod pushed by hand.
Medium Dense	11-30	12-35	15-40	35-65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Dense	31-50	35-60	40-70	65-85	Difficult to penetrate a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Very Dense	>50	>60	>70	85-100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer.

CONSISTENCY FINE-GRAINED SOIL

		TORVANE	POCKET PENETROMETER	
CONSISTENCY	SPT blows/ft	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by thumb. Extrudes between thumb and finger when squeezed in hand.
Soft	2-3	0.125-0.25	0.25-0.5	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Firm	4-7	0.25-0.5	0.5-1.0	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Stiff	8-14	0.5-1.0	1.0-2.0	Indented about 1/2 inch by thumb only with great effort.
Very Stiff	15-30	1.0-2.0	2.0-4.0	Readily indented with difficulty by thumbnail.
Hard	>30	>2.0	>4.0	Indented with difficulty by thumbnail.

REACTION WITH HCl

None	No visible reaction.
Weak	Some reaction, with bubbles forming slowly.
Strong	Violent reaction, with bubbles forming immediately.

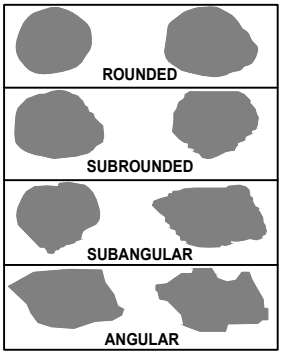
CEMENTATION

Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

STRUCTURE

Stratified	Alternating layers of varying material or color with layers at least 1/4" thick; note thickness.
Laminated	Alternating layers of varying material or color with layers at least 1/2" thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small macular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soil, such as small lenses or sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and thickness throughout.

PARTICLE SHAPE



EXPLORATION LOG KEY - SOIL

STRATA

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Project: CD23039A - Sandpoint Lift Stations

Client: Keller Associates, Inc. **Drill Rig:** G-2400

Date Drilled: 11-21-2023 **Borehole Diameter:** 7.0"

Depth to Groundwater: 5' **Logged By:** S. Litalien

STRATA

Boring: B-1

Depth (ft)	USCS Description	Symbol	Sample Type	Recovery (in)	Blows Per 6 Inches	SPT N-Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks
0	**Topsoil - Clayey Sand (SC)**, Dark brown, moist, fine, grass, roots, and organics scattered throughout.	SC	BG	14	1 1 3	4							
	Fill - Sandy Silt (ML), Brown, moist to wet, very soft to firm, fine to coarse, wood chips and fine to coarse gravel encountered throughout.												
				11.5	3 2 3	5		13.6		52.9	21	NP	pH - 6.79 Resistivity - 3,930 ohms-cm Sulfate - 30.8 mg/kg dry
5		ML		7.5	0 0 1	1							Water Level Measured 11-21-23
	Lean Clay (CL), Gray, wet, very soft to firm, iron oxide staining, thin seams of silty sand (SM) interbedded throughout.			0									
10				18	1 3 3	6		25.3					
15		CL						37.6	82.7	97	42	22	
				18	0 0 1	1	0.0						
20				10	0 0 0	0							pH - 6.88 Resistivity - 2,810 ohms-cm Sulfate - 12.7 mg/kg dry
25													

TEST BOREHOLE - STRATA PROJECT.GDT - 1/11/24 21:36 - F:\CLIENTS\KKELLER ASSOCIATES\2023\CD23039A SANDPOINT LIFT STATIONS\ELECTRONIC LOGS\CD23039A - LOGS.GPJ

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Project: CD23039A - Sandpoint Lift Stations

Client: Keller Associates, Inc. **Drill Rig:** G-2400

Date Drilled: 11-21-2023 **Borehole Diameter:** 7.0"

Depth to Groundwater: 5' **Logged By:** S. Litalien

STRATA

Boring: B-1

Depth (ft)	USCS Description	Symbol	Sample Type	Recovery (in)	Blows Per 6 Inches	SPT N-Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks
25	**Lean Clay (CL)**, Gray, wet, very soft to firm, iron oxide staining, thin seams of silty sand (SM) interbedded throughout. *(continued)*	CL		18	0 0 0	0							Note: BGS = Below Ground Surface
30	**Fat Clay (CH)**, Gray, wet, very soft, iron oxide staining, thin seams of silty sand (SM) interbedded throughout.			18				46.1	74.7	100	54	30	
				18	0 0 0	0							
35		CH		18	0 0 0	0							
40				18	0 0 0	0		47.6					

Borehole Terminated at 41.5 Feet.

Latitude: 48.27067
Longitude: -116.54652

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Project: CD23039A - Sandpoint Lift Stations
Client: Keller Associates, Inc.
Drill Rig: G-2400
Date Drilled: 11-21-2023
Borehole Diameter: 7.0"
Depth to Groundwater: 2'
Logged By: S. Litalien

STRATA

Boring: B-2

Depth (ft)	USCS Description	Symbol	Sample Type	Recovery (in)	Blows Per 6 Inches	SPT N-Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks
0	**Topsoil** - **Sandy Lean Clay (CL)**, Light brown, moist, firm, grass, roots, and organics throughout.	CL		14	1 3 3	6		26.2					
	Fill - Wood Chips, water encountered, no soil encountered in fill layer.												Water Level Measured 11-21-23
				2	1 0 0	0							Strong decaying organic material odor from wood chip layer residing in ground water.
5					1 2 3	5							
	Fat Clay (CH), Gray, wet, very soft to firm, iron oxide staining			12				27.7	93	98	51	29	
10		CH		18	1 3 4	7	1.5						
				18	0 0 3	3	1.5						pH - 6.26 Resistivity - 1,860 ohms-cm Sulfate - 8.83 mg/kg dry
15				18	0 1 2	3		45.3					
	Lean Clay (CL), Light gray with orange staining, wet, very soft to stiff												
20		CL		18	0 0 0	0	0.0	49.8					
25													

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Project: CD23039A - Sandpoint Lift Stations

Client: Keller Associates, Inc. **Drill Rig:** G-2400

Date Drilled: 11-21-2023 **Borehole Diameter:** 7.0"

Depth to Groundwater: 2' **Logged By:** S. Litalien

STRATA

Boring: B-2

Depth (ft)	USCS Description	Symbol	Sample Type	Recovery (in)	Blows Per 6 Inches	SPT N-Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks
25	**Lean Clay (CL)**, Light gray with orange staining, wet, very soft to stiff *(continued)*	CL		18				49.4	80.3	86	44	18	Note: BGS = Below Ground Surface
				18	0 0 0	0	0.0						
30					0 8 0	8							
35				18	0 0 0	0		47.7					
40				0	0 0 0	0							

Borehole Terminated at 41.5 Feet.

Latitude: 48.27358
Longitude: -116.54362

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Appendix B
Laboratory Test Results

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ASTM D6913-17

Report Date: 12/11/2023

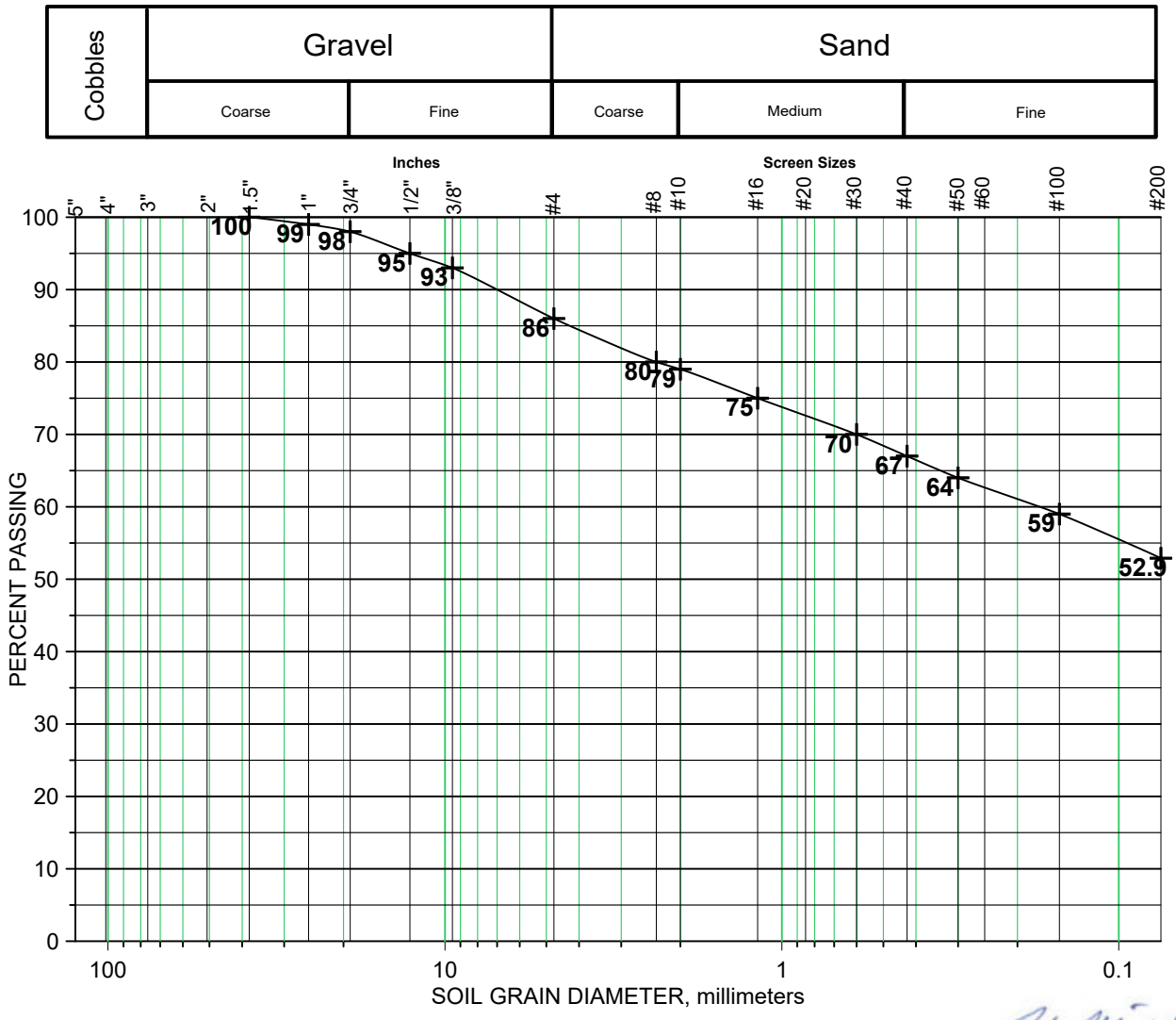
Hayden
1016 West Hayden Avenue
Hayden, ID 83835
Phone: 208.772.2428

Client
Keller Associates, Inc.
601 Sherman Avenue, Suite 1
Coeur d'Alene, ID 83814

Project
CD23039A
Sandpoint Lift Stations
Sandpoint, ID

SAMPLE INFORMATION

SAMPLE NO.:	49680	**SAMPLE DATE:**	11/21/2023
SPECIMEN SIZE:	Bulk	**TEST DATE:**	12/11/2023
USCS CLASSIFICATION:	Sandy Silt (ML)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	G. Hausmann
METHOD:	Bulk Sampling	**BORING NO.:**	B-1
		DEPTH (FT):	1.5-5.0



Reviewed by Luke Michels, P.E.
Engineering Services Manager

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ASTM D6913-17

Report Date: 1/8/2024

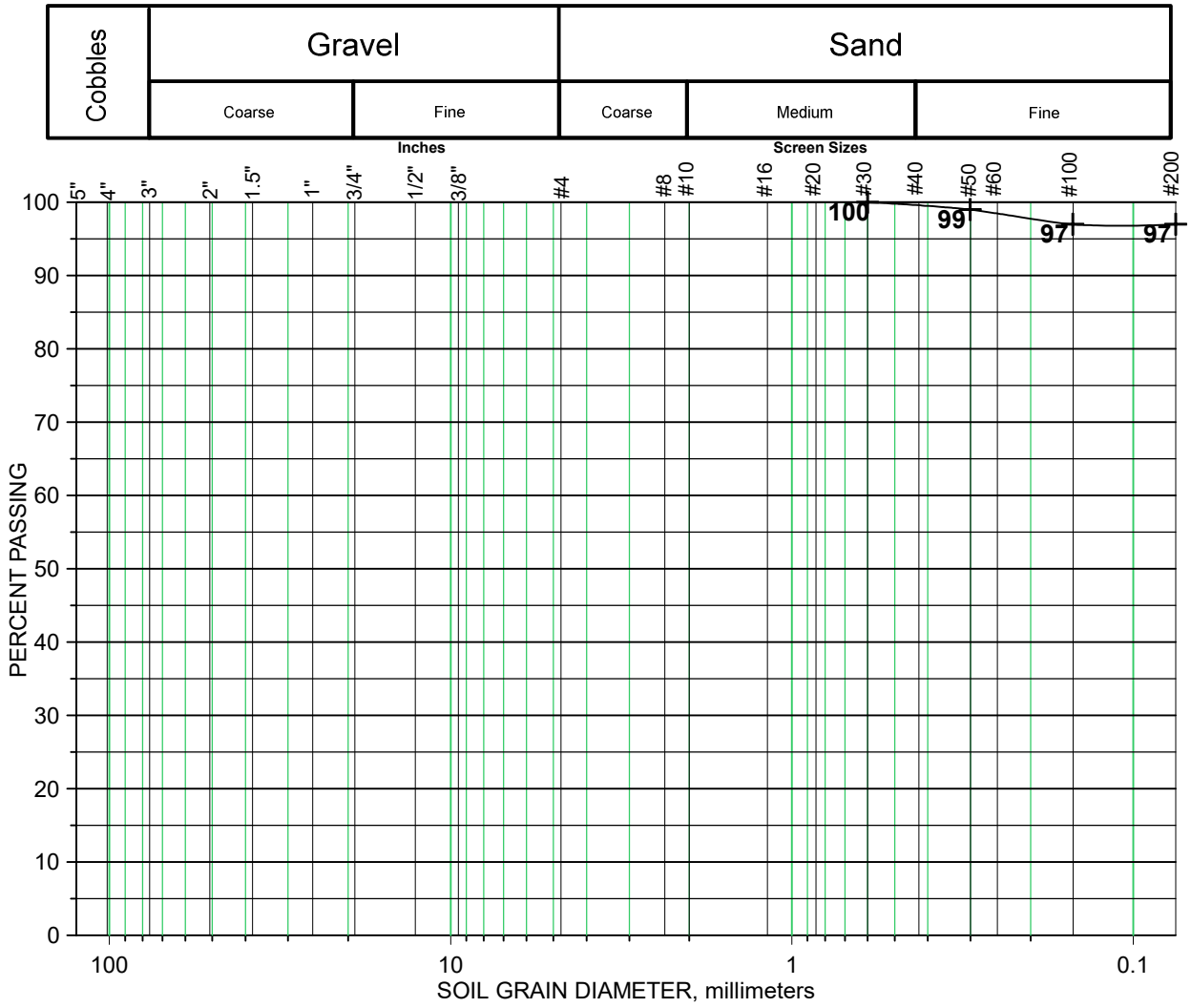
Boise
8653 West Hackamore Drive
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49570	**SAMPLE DATE:**	11/21/2023
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/28/2023
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	D. Bjorum
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube	**BORING NO.:**	B1
		DEPTH (FT):	15.0-16.5



Reviewed by Keith Wildman
Laboratory Services Coordinator

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Report Date: 1/8/2024

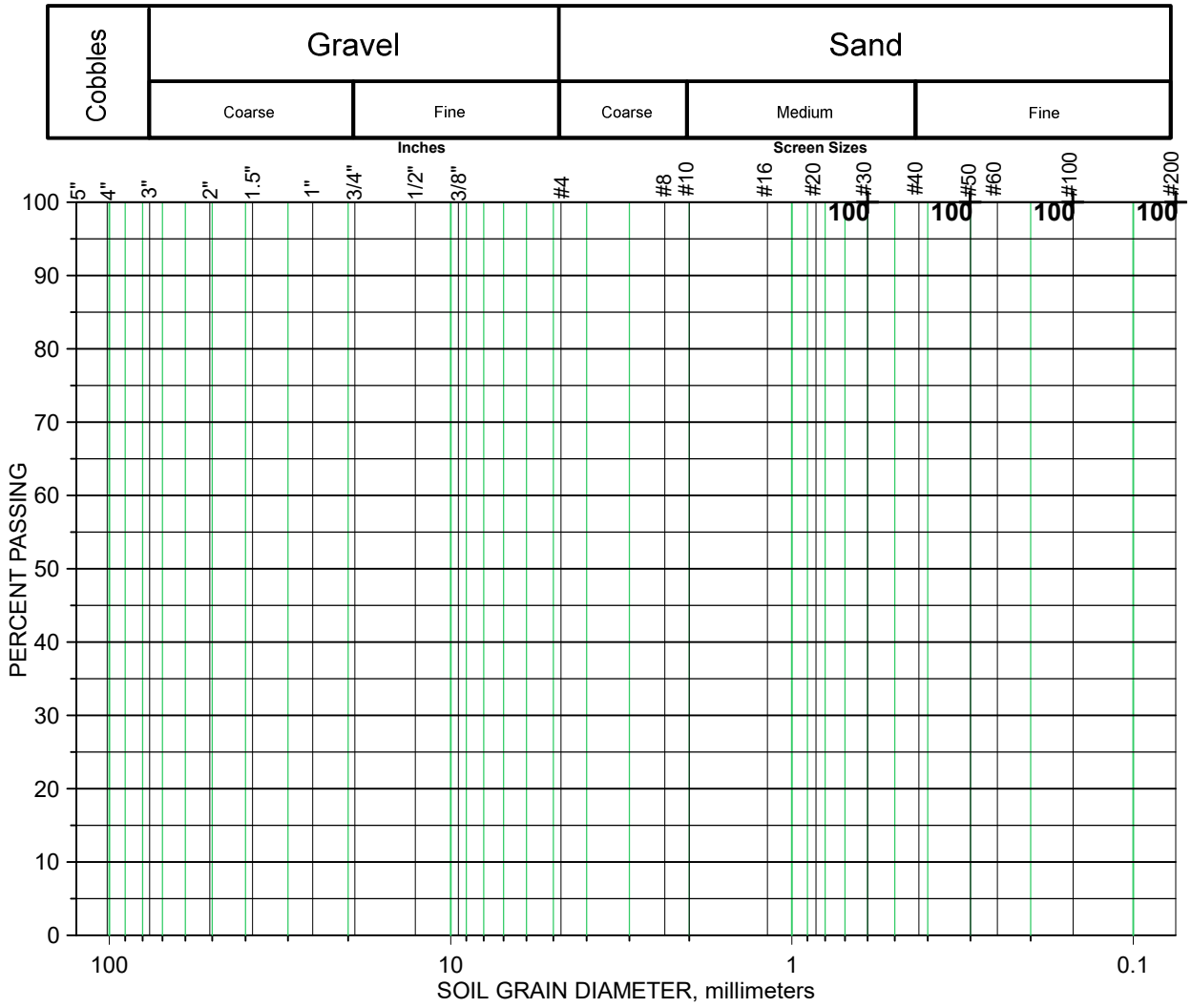
Boise
8653 West Hackamore Drive
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49571	**SAMPLE DATE:**	11/21/2023
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/28/2023
USCS CLASSIFICATION:	Fat Clay (CH)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	D. Bjorum
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube	**BORING NO.:**	B1
		DEPTH (FT):	30.0-31.5



Reviewed by Keith Wildman
Laboratory Services Coordinator

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Report Date: 1/8/2024

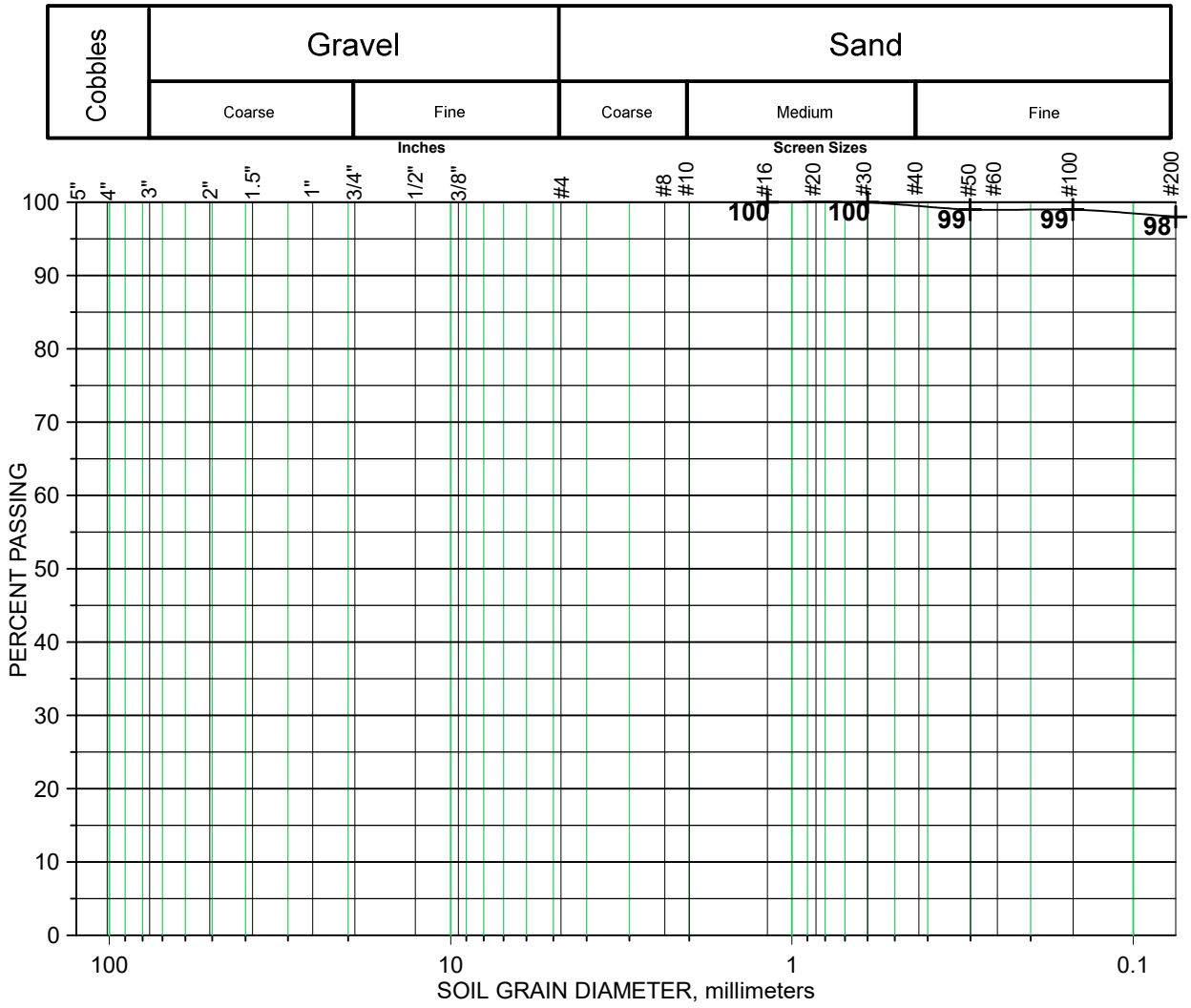
Boise
8653 West Hackamore Drive
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49572	**SAMPLE DATE:**	11/21/2023
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/28/2023
USCS CLASSIFICATION:	Fat Clay (CH)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	D. Bjorum
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube	**BORING NO.:**	B2
		DEPTH (FT):	7.5-9.0



Reviewed by Keith Wildman
Laboratory Services Coordinator

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

ASTM D6913-17

Report Date: 1/8/2024

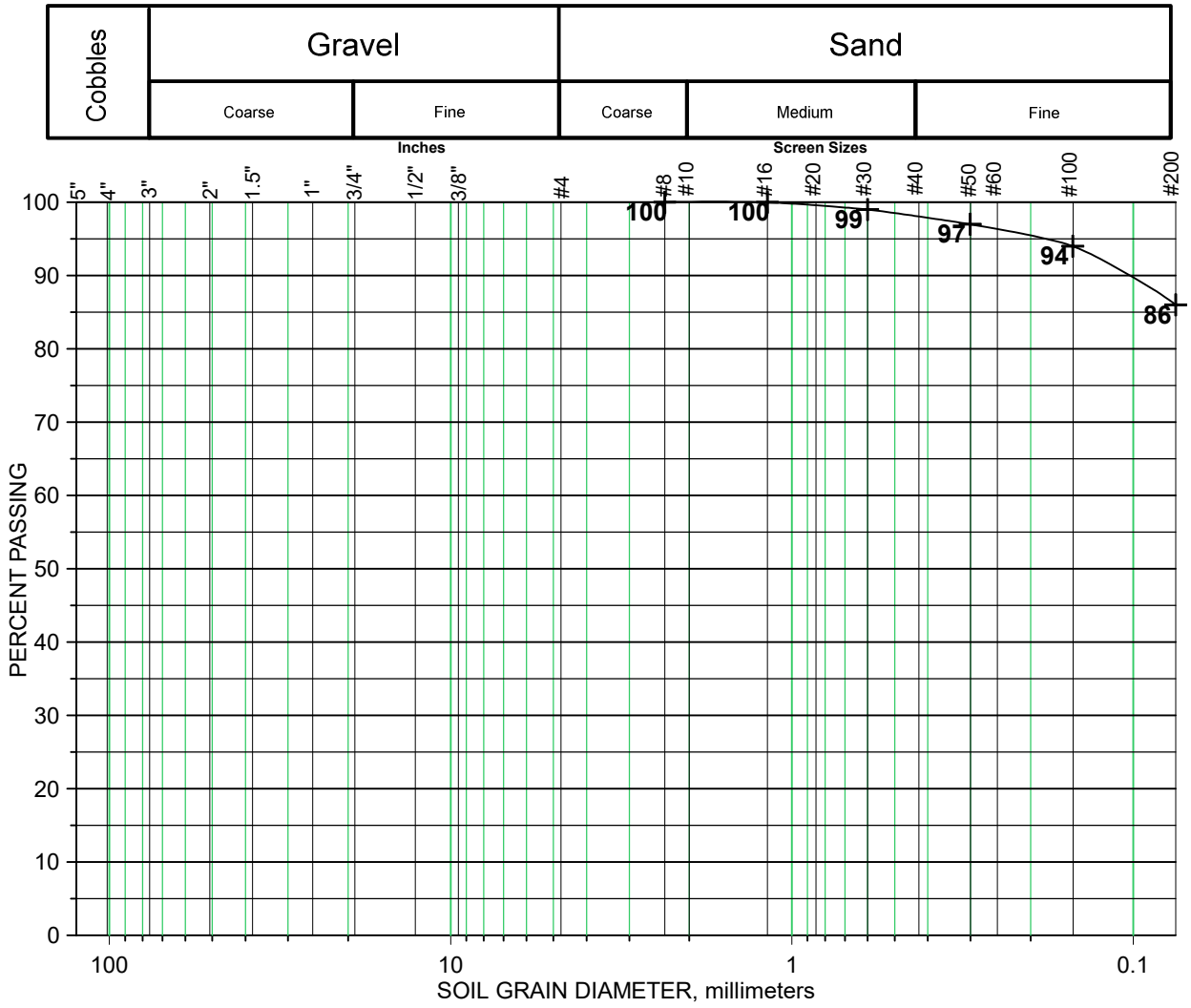
Boise
8653 West Hackamore Drive
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49573	**SAMPLE DATE:**	11/21/2023
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/28/2023
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	D. Bjorum
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube	**BORING NO.:**	B2
		DEPTH (FT):	25.0-26.5



Reviewed by Keith Wildman
Laboratory Services Coordinator

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Boise, ID 83709
Phone: 208.376.8200

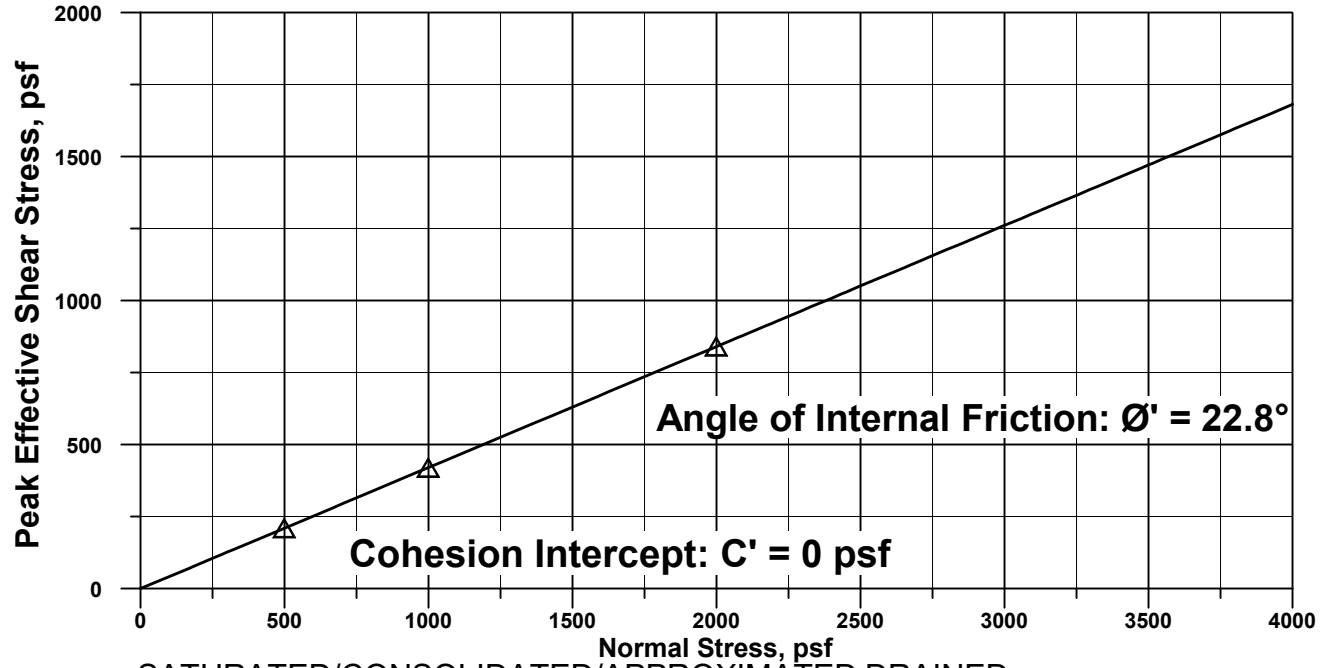
ASTM D3080

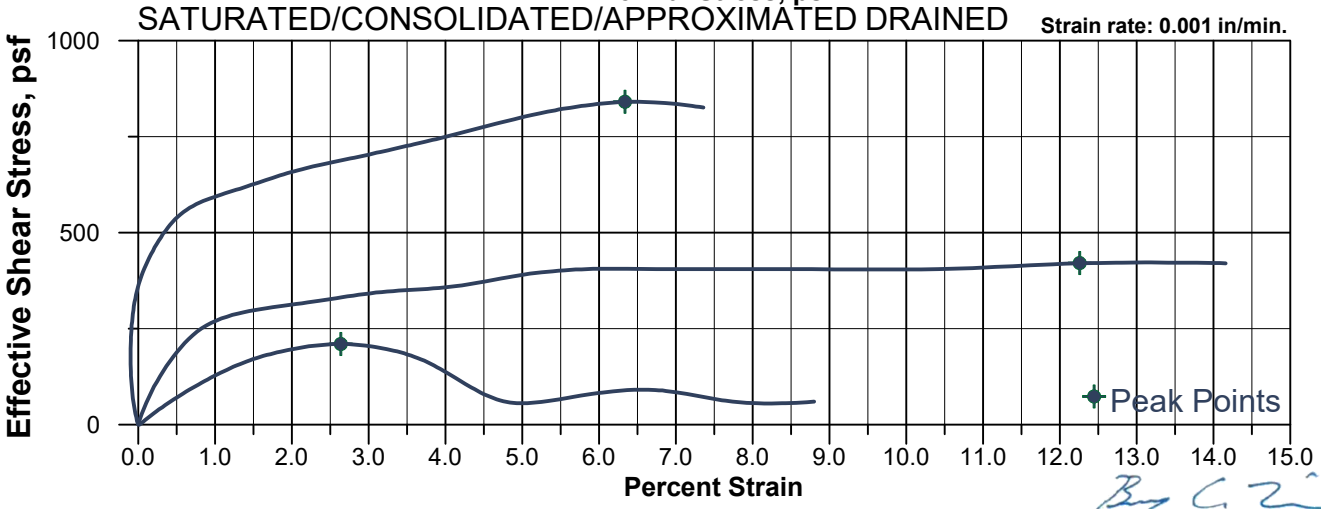
Report Date: 1/8/2024

Client	Project
Keller Associates, Inc.	CD23039A Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49570	**SAMPLE DATE:**	11/21/2023	**SOURCE.:**	B1
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/29/2023	**LOCATION:**	15.0-16.5
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	D. Bjorum		
APPARATUS:	SoilsTest	**MOISTURE CONTENT:**	37.6%		
SAMPLE PREP:	Intact	**DRY UNIT WEIGHT:**	82.7 pcf		





Reviewed by Barry Miller
P.G., P.E.

REMARKS: None

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Boise
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Boise, ID 83709
Phone: 208.376.8200

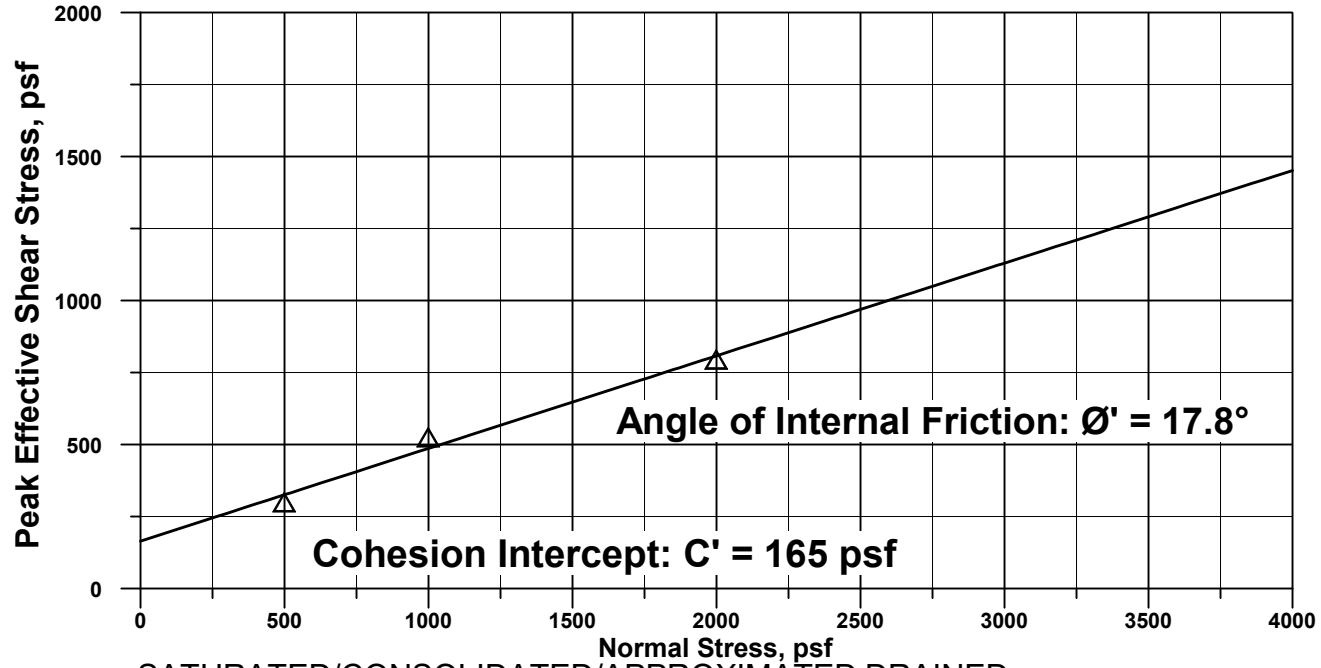
ASTM D3080

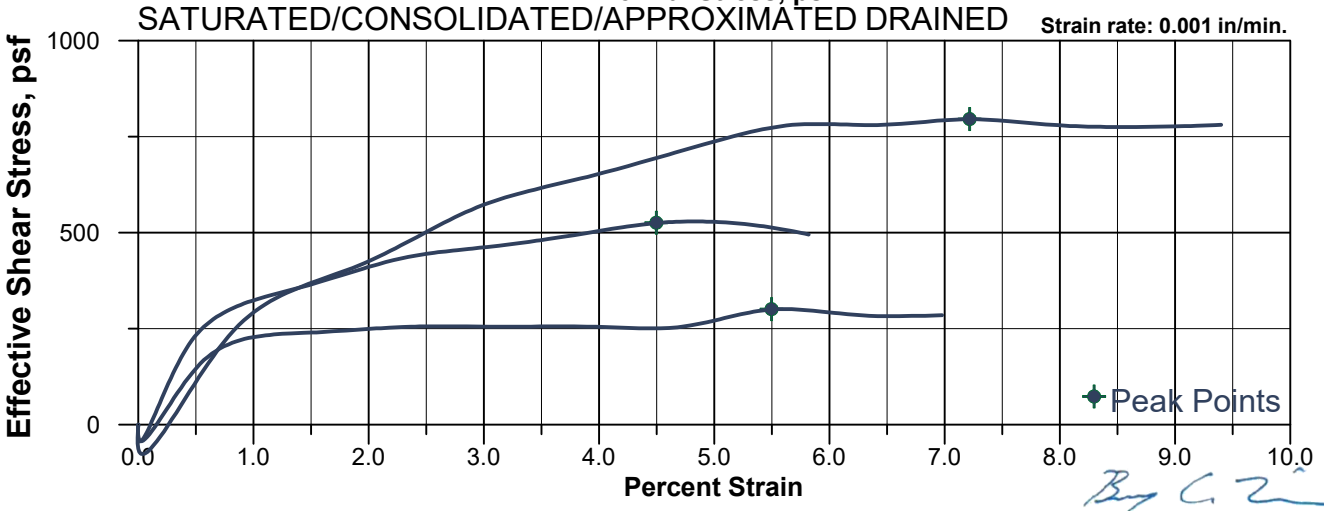
Report Date: 10/25/2023

Client	Project
Keller Associates, Inc.	CD23039A Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE NO.:	49572	**SAMPLE DATE:**	11/21/2023	**SOURCE.:**	B2
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	01/02/2024	**LOCATION:**	7.5-9.0
USCS CLASSIFICATION:	Fat Clay (CH)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	D. Bjorum		
APPARATUS:	SoilsTest	**MOISTURE CONTENT:**	27.7%		
SAMPLE PREP:	Intact	**DRY UNIT WEIGHT:**	94.1 pcf		





Reviewed by Barry Miller
P.G., P.E.

REMARKS: None

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

ASTM D2850 (UU Saturated)

Report Date: 1/9/2024

Boise
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Boise, ID 83709
Phone: 208.376.8200

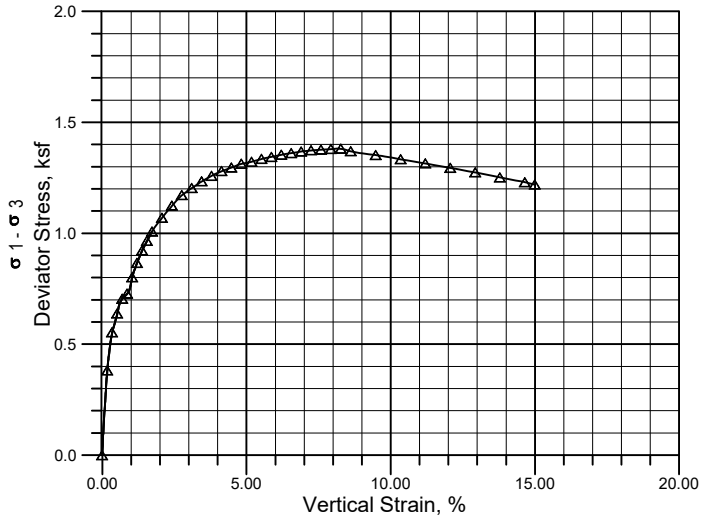
Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

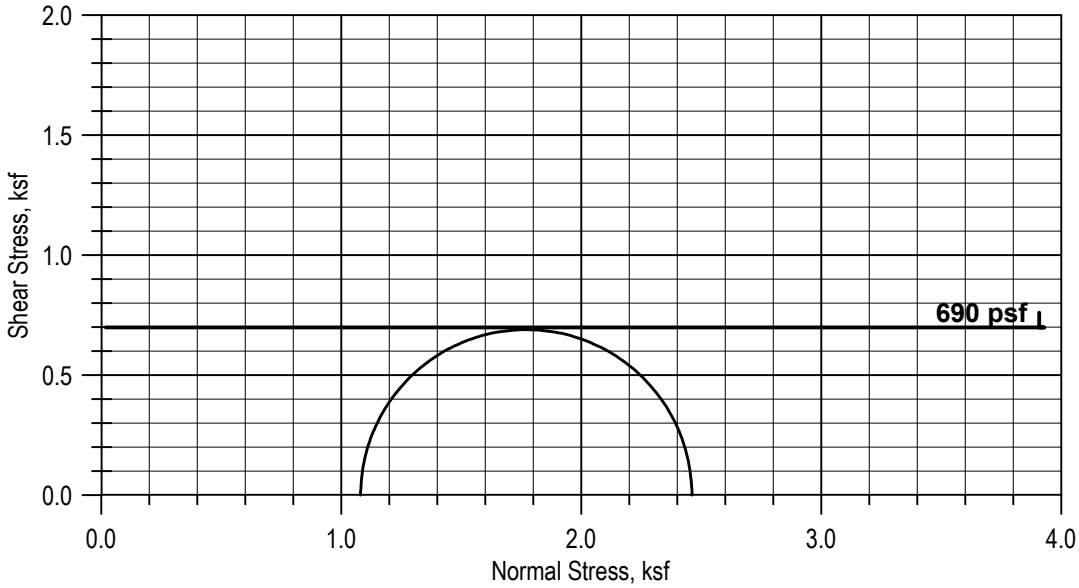
SAMPLE No.:	49570	**SAMPLE DATE:**	11/21/2023	**BORING No.:**	B1
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	1/9/2024	**DEPTH (FT):**	15.0-16.5
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		
APPARATUS:	Geo Jac	**METHOD:**	ASTM D1587 - Sampling by Thin-Walled Tube		
SAMPLE PREP:	Intact				

Deviator Stress vs % Strain



SPECIMEN PROPERTIES

INITIAL MOISTURE CONTENT:	37.6%
DRY UNIT WEIGHT:	82.7 pcf
HEIGHT TO DIAMETER RATIO:	2.01:1
CONFINEMENT PRESSURE:	7.5 psi (1.08 ksf)
MAX. DEVIATOR STRESS:	1.38 ksf @ 8.3% Strain
SATURATION:	97.6%
CROSS-SECTIONAL AREA:	6.514 (in²)





At 15% Strain

Rate of Strain, %/min: 1

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P.G., P.E.

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ASTM D2850 (UU Saturated)

Report Date: 1/9/2024

Boise
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Boise, ID 83709
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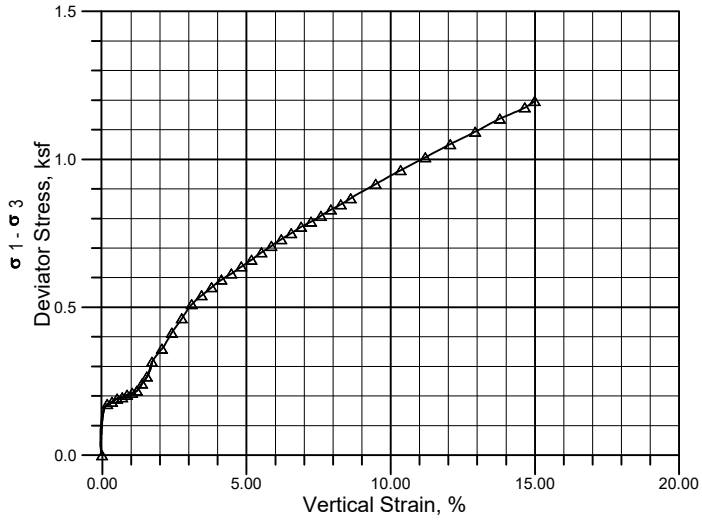
Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

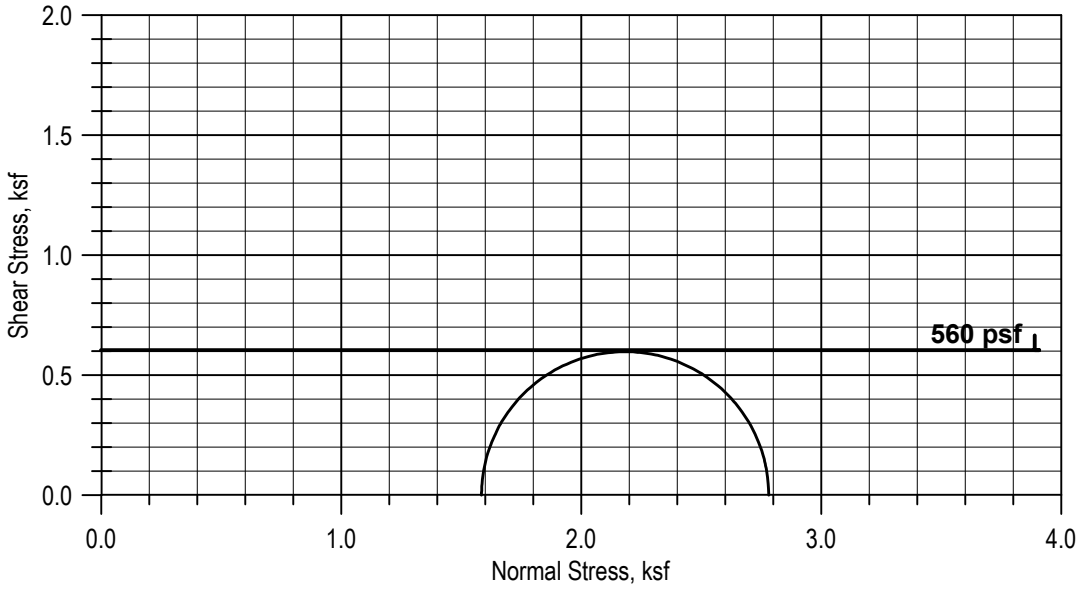
SAMPLE No.:	49573	**SAMPLE DATE:**	11/21/2023	**BORING No.:**	B2
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	1/9/2024	**DEPTH (FT):**	25.0-26.5
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		
APPARATUS:	Geo Jac	**METHOD:**	ASTM D1587 - Sampling by Thin-Walled Tube		
SAMPLE PREP:	Intact				

Deviator Stress vs % Strain



SPECIMEN PROPERTIES

INITIAL MOISTURE CONTENT:	48.7%
DRY UNIT WEIGHT:	80.3 pcf
HEIGHT TO DIAMETER RATIO:	2.01:1
CONFINEMENT PRESSURE:	11 psi (1.58 ksf)
MAX. DEVIATOR STRESS:	1.12 ksf @ 15% Strain
SATURATION:	100%
CROSS-SECTIONAL AREA:	6.514 (in²)





At 15% Strain

Rate of Strain, %/min: 1

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

ASTM D2166

Report Date: 1/8/2024

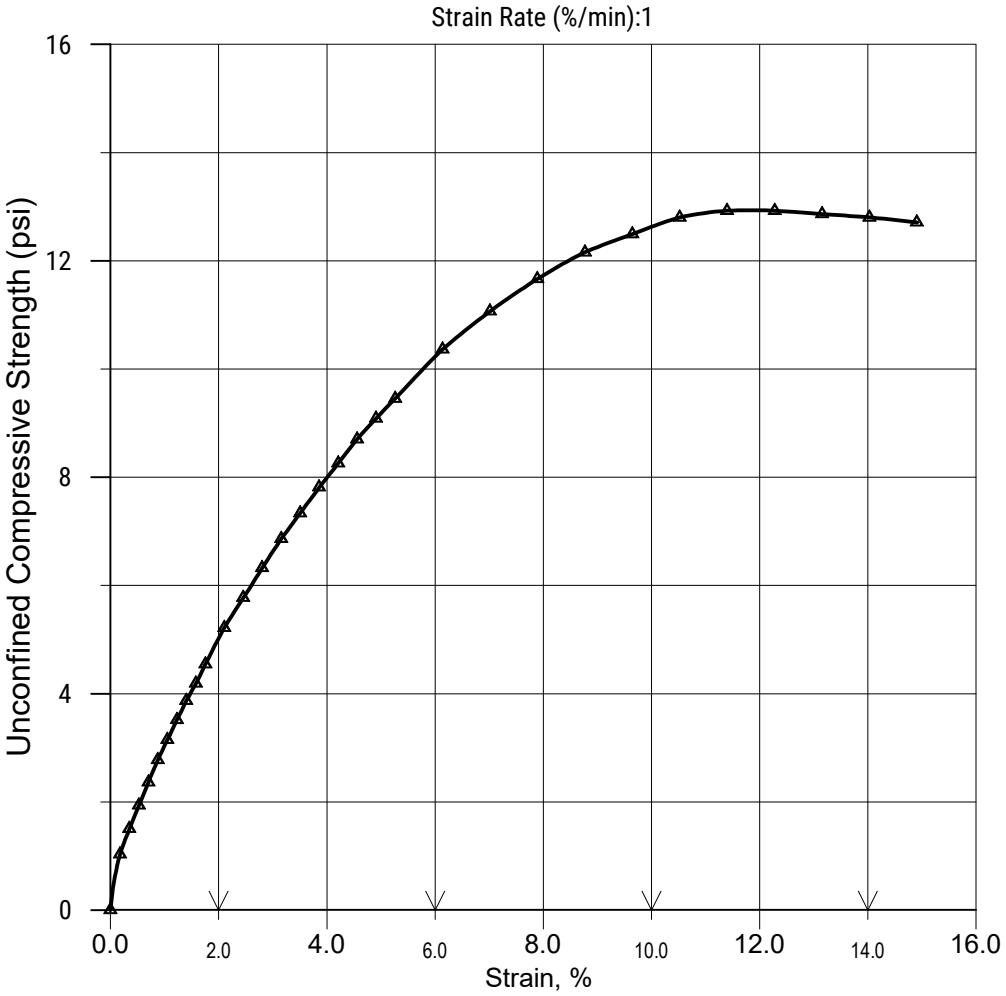
Boise
8653 W. Hackamore Dr.
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.

Project
CD23039
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE No.:	49572	**SAMPLE DATE:**	11/21/2023	**BORING No.:**	B-2
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/28/2023	**DEPTH (FT):**	7.5-9.0
USCS CLASSIFICATION:	Fat Clay (CH)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	D. Bjorum		
APPARATUS:	GeoJac	**MOISTURE CONTENT:**	27.7%	**UNIT WEIGHT:**	94.1 pcf
SAMPLE PREP:	Intact	**L/D RATIO:**	1.98:1		





Diameter (in): 2.88 Height (in): 5.7 Area (in²): 6.514

Unconfined Compressive Strength (psi): 12.93 (1.861 ksf) @ 11.4% Strain

REMARKS: None

Reviewed by Barry Miller
P.G., P.E.

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Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

ASTM D2435

Report Date: 1/11/2024

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

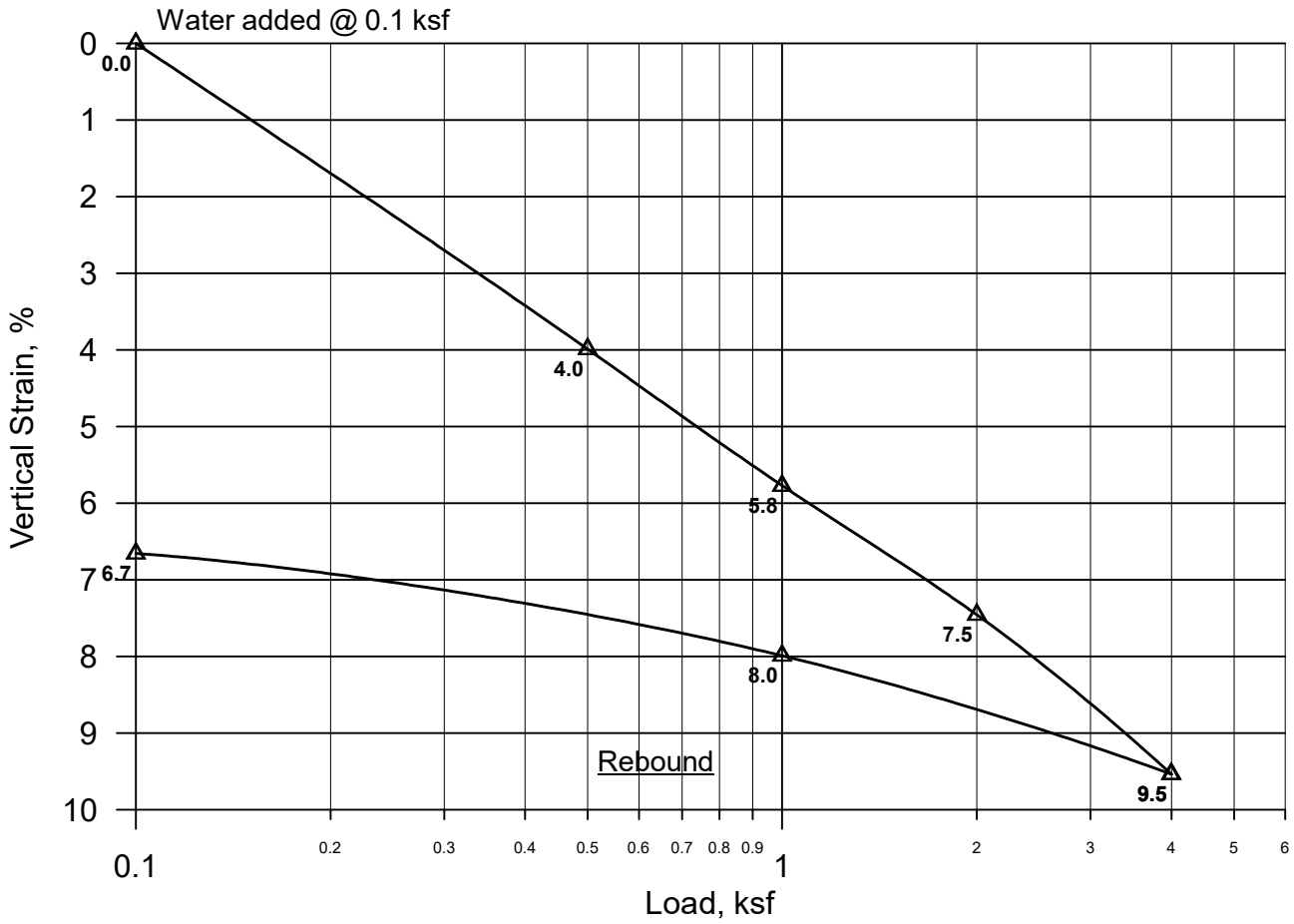
Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE No.:	19571	**SAMPLE DATE:**	11/21/2023	**BORING No.:**	B1
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/27/2023	**DEPTH (FT):**	30.0-31.5
USCS CLASSIFICATION:	Fat Clay (CH)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		

APPARATUS:	Humboldt Load Frame	**INITIAL MOISTURE CONTENT:**	46.1%
SAMPLE PREP:	Intact	**DRY UNIT WEIGHT:**	74.7 pcf
TEST WATER:	Tap		
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube		



REMARKS: None

Reviewed by Barry Miller
P.G., P.E.

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ASTM D2435

Report Date: 1/11/2024

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

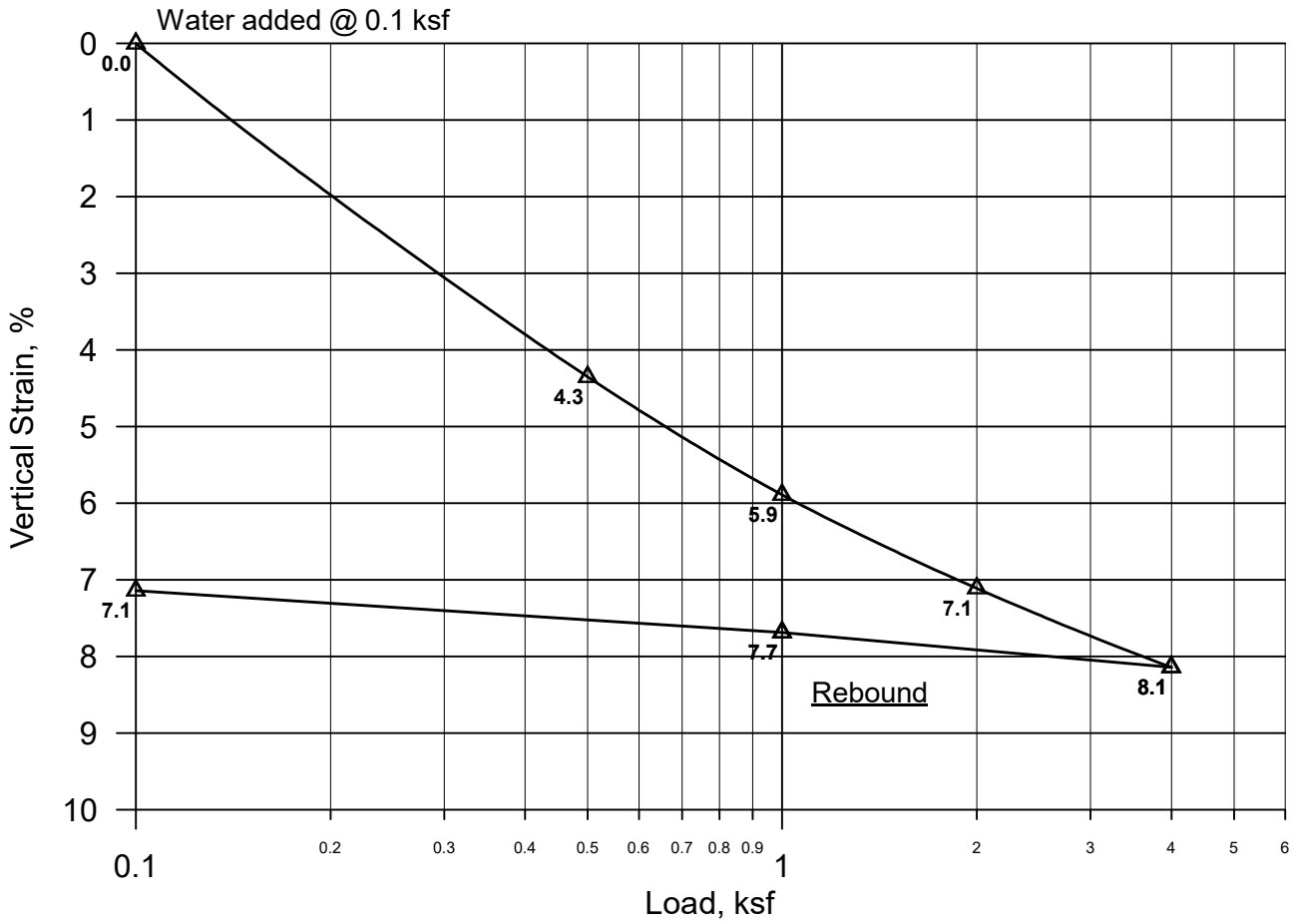
Client
Keller Associates, Inc.

Project
CD23039A
Sandpoint Lift Stations

SAMPLE INFORMATION

SAMPLE No.:	49573	**SAMPLE DATE:**	11/21/2023	**BORING No.:**	B2
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	12/27/2023	**DEPTH (FT):**	25.0-26.5
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		

APPARATUS:	Humboldt Load Frame	**INITIAL MOISTURE CONTENT:**	48.7%
SAMPLE PREP:	Intact	**DRY UNIT WEIGHT:**	80.3 pcf
TEST WATER:	Tap		
METHOD:	ASTM D1587 - Sampling by Thin-Walled Tube		



REMARKS: None

Reviewed by Barry Miller
P.G., P.E.

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Anatek Labs, Inc.

1282 Alturas Drive - Moscow, ID 83843 - (208) 883-2839 - email moscow@anateklabs.com
504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Client:	Strata, Inc. (Hayden)	Work Order:	WDL0311
Address:	1016 W. Hayden Avenue	Project:	CD23039A
	Hayden, ID 83835	Reported:	12/19/2023 08:41
Attn:	Luke Michels		

Analytical Results Report

Sample Location:	B-1 1.5'-5.0'		
Lab/Sample Number:	WDL0311-01	Collect Date:	11/21/23 00:00
Date Received:	12/08/23 14:50	Collected By:	Steve Litalien
Matrix:	Soil		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
% Solids	88.1	%	0.100	12/12/23 13:13	SBS	SM 2540 G	
pH	6.79	pH Units	1.00	12/8/23 19:22	ILG	EPA 9045D	H3
Resistivity	3930	ohms-cm	1.00	12/14/23 19:37	ILG	ASTM G 57a	
Sulfate	30.8	mg/kg dry	1.55	12/9/23 19:26	ic	EPA 300.0	

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Sample Location:	B-1 16.5'-18.0' 20.0'-21.5'		
Lab/Sample Number:	WDL0311-02	Collect Date:	11/21/23 00:00
Date Received:	12/08/23 14:50	Collected By:	Steve Litalien
Matrix:	Soil		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
% Solids	68.1	%	0.100	12/12/23 13:13	SBS	SM 2540 G	
pH	6.88	pH Units	1.00	12/8/23 19:24	ILG	EPA 9045D	H3
Resistivity	2810	ohms-cm	1.00	12/14/23 19:45	ILG	ASTM G 57a	
Sulfate	12.7	mg/kg dry	1.83	12/9/23 19:46	ic	EPA 300.0	

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Sample Location:	B-2 9.0'-10.5'-12.0'		
Lab/Sample Number:	WDL0311-03	Collect Date:	11/21/23 00:00
Date Received:	12/08/23 14:50	Collected By:	Steve Litalien
Matrix:	Soil		

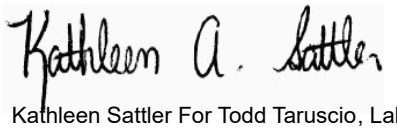
Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
% Solids	75.8	%	0.100	12/12/23 13:13	SBS	SM 2540 G	
pH	6.26	pH Units	1.00	12/8/23 19:25	ILG	EPA 9045D	H3
Resistivity	1860	ohms-cm	1.00	12/14/23 19:57	ILG	ASTM G 57a	
Sulfate	8.83	mg/kg dry	1.93	12/9/23 20:06	ic	EPA 300.0	

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

Anatek Labs, Inc.

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Authorized Signature,



Kathleen Sattler For Todd Taruscio, Laboratory Manager

H3	Sample was received past holding time.
PQL	Practical Quantitation Limit
ND	Not Detected
MCL	EPA's Maximum Contaminant Level
Dry	Sample results reported on a dry weight basis
*	Not a state-certified analyte

RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was spiked or duplicated.

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The results reported related only to the samples indicated.

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Quality Control Data

Inorganics

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BDL0409 - W Ions										
Blank (BDL0409-BLK1)					Prepared & Analyzed: 12/8/2023					
Sulfate	ND		1.50	mg/kg wet						
LCS (BDL0409-BS1)					Prepared & Analyzed: 12/9/2023					
Sulfate	3.63			mg/L	4.00		90.8	90-110		
LCS (BDL0409-BS2)					Prepared & Analyzed: 12/9/2023					
Sulfate	3.72			mg/L	4.00		93.0	90-110		

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

ANATEK LABS

Chain of Custody Record

Anate
1282 Alturas Drive, M
504 E Sprague Ste D, S

WDL0311

Due: 12/26/23

Tu

Company Name: STRATA	Project Manager: Luke Michels
Address: 1016 W. Hayden Ave.	Project Name & #: CD23039A
City: Hayden State: ID Zip: 83835	Purchase Order #:
Phone: 208-772-2428	Sampler Name & Phone: Steve Litalien; 208-818-7535
Email Address(es): lmichels@stratageotech.com	

Pleas
www.anateklabs.com/pricing-lists

- ✓ Normal
- __ Next Day*
- __ 2nd Day*
- __ Other*_____
- __ Phone
- ✓ Email

*All rush order requests must have prior approval

List Analytes Requested | **Note Special Instructions/Comments**

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	pH/ASTM 4972	Resistivity ASTM G 187	Sulfate EPA 300.0
	B-1 1.5'-5.0'	11/21/2023	Soil	1	0.5	X	X	X
	B-1 16.5'-18.0'+20.0'-21.5'	11/21/2023	Soil	1	0.5	X	X	X
	B-2 9.0'-10.5'+10.5'-12.0'	11/21/2023	Soil	1	0.5	X	X	X

Preservative:

Inspection Checklist

Received Intact?	Y	N
Labels & Chains Agree?	Y	N
Containers Sealed?	Y	N
No VOC Head Space?	Y	N
Cooler?	Y	N
Ice/Ice Packs Present?	Y	N

Temperature (°C):_____
Number of Containers:_____
Shipped Via: HP
Preservative:_____

Date & Time: 12/8/23 1450
Inspected By:

	Printed Name	Signature	Company	Date	Time
Relinquished by	Jarod Imel		Strata	12/8/23	2:46 pm
Received by	Kiley Cox		Anatek	12/8	1450
Relinquished by					
Received by					
Relinquished by					
Received by					

Samples submitted to Anatek Labs may be subcontacted to other accredited labs if necessary. This message serves as notice of this possibility. Subcontracted analyses will be clearly noted on the analytical report.

Docusign Envelope ID: C7E20A37-A1F1-41F3-A4C5-2B731B3257C0

RFQ No. 24-3257-2
LIFT STATION REPLACEMENTS

ADDENDUM NO. 1

DATE:	August 12, 2024
SUBMISSION DEADLINE:	**Thursday, August 29, 2024 @ 2:00:00 P.M.**
PAGES:	Addendum (1 page)
	Bid Bond (2 pages)

Acknowledge receipt of this Addendum by inserting its number and date on the Bid Form. Failure to do so may subject bidder to disqualification. This Addendum forms a part of the Contract Documents. It modifies the Contract Documents as follows:

SECTION 3-B – BID BOND

ISPWC 00430 - Bid Bond

Delete Bid Bond in its entirely and replace with the attached.

END OF ADDENDUM NO. 1

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BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name: Address *(principal place of business)*:	Name: Address *(principal place of business)*:
Owner	**Bid**
Name: City of Sandpoint Address *(principal place of business)*: 1123 Lake Street Sandpoint, ID 83864	Project *(name and location)*: 2024 Lift Station Replacements Bid Due Date: **August 29 2024**
Bond	
Penal Sum: Date of Bond:	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
   3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   3.2. All Bids are rejected by Owner, or
   3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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PERFORMANCE BOND

Contractor	**Surety**
Name: **Simco Development Group LLC**	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Contract**
Name: City of Sandpoint	Description *(name and location)*:
Mailing address *(principal place of business)*:	**A24-3257-8** **2024 Lift Station Replacements**
1123 Lake St. Sandpoint, Idaho 83864	Contract Price:
	Effective Date of Contract:

Bond

Bond Amount:

Date of Bond:

(~~Date of Bond cannot be earlier than~~ Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

    3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

    3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

    3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

    5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

    5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

    5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

    5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

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5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

   7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

   7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

   7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

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statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

    14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

    14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

    14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

    14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

    14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **None**

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PAYMENT BOND

Contractor	**Surety**
Name: **Simco Development Group LLC** Address *(principal place of business)*:	Name: Address *(principal place of business)*:
Owner	**Contract**
Name: **City of Sandpoint** Mailing address *(principal place of business)*: **1123 Lake St.** **Sandpoint, ID 83864**	Description *(name and location)*: **A24-3257-8** **2024 Lift Station Replacements** Contract Price: Effective Date of Contract: **September 20, 2024**

Bond

Bond Amount:

Date of Bond:

(~~Date of Bond cannot be earlier than~~ Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____ *(Full formal name of Contractor)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature)(Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
    5.1. Claimants who do not have a direct contract with the Contractor
        5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
    5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
    7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
    7.2. Pay or arrange for payment of any undisputed amounts.
    7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

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8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

    16.1. *Claim*—A written statement by the Claimant including at a minimum:

        16.1.1. The name of the Claimant;

        16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

        16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

        16.1.4. A brief description of the labor, materials, or equipment furnished;

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16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.1.7. The total amount of previous payments received by the Claimant; and

16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows: **None**

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ISPWC - BIDDER'S CHECK LIST

The Bidder's Check List is offered to assist the prospective bidder in checking his/her Bid. This checklist does not relieve the bidder from properly completing his/her Bid.

Check off when completed:

1. ✓ Are all blank spaces filled out on Bid Form?
2. ✓ Have questions arising from the bidding, contract, specifications or plans been submitted to the proper authority and resolved in the proper manner?
3. ✓ Are Bid amounts shown correctly as well as extensions and totals? Recheck for errors or omissions. Both lump sum and unit prices must be shown in words and figures.
4. ✓ Are authorized signatures properly affixed to the Bid form, giving also title, and Idaho Public Works Contractor license number, evidence of authority to sign, etc.?
5. ✓ Have all plumbing, heating, air conditioning and electrical subcontractors to whom work will be awarded been listed, as well as their Idaho Public Works Contractor license number?
6. ✓ Have all other subcontractors, suppliers, individuals or entities as required in the Instructions to Bidders been listed, and in the case of subcontractors, their Idaho Public Works Contractor license number?
7. ✓ Have all Addenda been received and acknowledged with the proper signature on the Bid Form?
8. ✓ In order for a Bid to be considered, the Bid form, Bid Security, naming of subcontractors form, and other required attachments must be placed in a properly addressed sealed envelope and delivered to the specified authority prior to the time designated for the bid opening.
9. ✓ Has Bid Security been enclosed?
10. ✓ Has Bidder performed examinations in accordance with the Instructions to Bidders?
11. ✓ Has Bidder included additional information required in Article 15 of the Instructions to Bidders?

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BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

City of Sandpoint
City Clerk
1123 Lake Street
Sandpoint, ID 83864

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security in the form of: cash, a certified check, cashier's check, or a Bid bond (on the form attached) issued by a surety meeting the requirements of the General Conditions.;

B. Bidder shall include in his Bid the name, or names and address, or addresses, and Idaho Public Works Contractor License Numbers of the Subcontractors who shall, in the event the Bidder secures the Contract, subcontract the plumbing, heating and air-conditioning work, and electrical work under the General Contract;

C. State of Idaho Public Works Contractor's License No.: 028733-AA-1 ;

ARTICLE 3—BASIS OF BID—LUMP SUM PRICES

BASE BID WORK as indicated in the bidding documents:

A complete reconstruction of two City of Sandpoint lift stations; one at City Beach and the other along Superior St West of Iberian Way. The work generally includes the demolition and replacement of two lift stations, installation of related appurtenances and instrumentation, and site restoration and cleanup.

$ 1,198,700.00 , which sum is hereafter called the base bid.

One Million, One Hundred Ninety-Eight Thousand, Seven Hundred Dollars and 00/100

(bidder to insert base bid amount on line above)

3.01

BID ALTERNATES as indicated in the bidding documents

ALTERNATE # 1: The contractor shall provide ornamental welded steel fencing and swing gates and

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appurtenant work, complete and operable.

ADD TO BASE BID: $ $15,000.00

Fifteen Thousand Dollars + 00/100

BID SCHEDULE A – BASE BID

A. Bidder acknowledges that:

1. Each Bid Lump Sum Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item,
2. Each Lump Sum Price includes all applicable taxes and fees, and

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date
1	8/12/24
Q+A 1	8/22/24
Q+A 2	8/22/24
Q+A 3	8/26/24

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

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3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

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4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 6.02.A:

   a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

   b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

   c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

   d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder: Simco
(typed or printed name of organization)

By: *(individual's signature)*

Name: Jason C. Simmons
(typed or printed)

Title: member
(typed or printed)

Date: 8/29/24
(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: *(individual's signature)*

Name: Taylor Tompke
(typed or printed)

Title: Project Manager/Engineer
(typed or printed)

Date: 08/29/24
(typed or printed)

Address for giving notices:
PO Box 2023
Hayden, ID 83835

Bidder's Contact:

Name: Taylor Tompke
(typed or printed)

Title: PM/engineer
(typed or printed)

Phone: 208-610-4536

Email: taylor@simcodg.com

Address:
PO Box 2023
Hayden, ID 83835

Bidder's Contractor License No.: (if applicable) 028733-AA

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Naming of Subcontractors Form

Per Idaho Code, 67-2310, Bidder shall include in his or her Bid the names and address, and Idaho Public Works Contractor License Number of the Subcontractors who shall, in the event the Bidder secures the Contract, subcontract the plumbing, heating and air-conditioning work, and electrical work under the general Contract. Failure to name Subcontractors as required shall render any Bid submitted by the Bidder unresponsive and void.

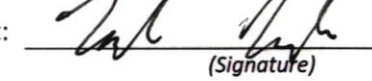
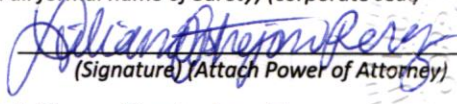
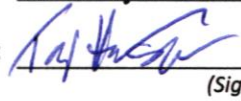
Subcontractor Name and Address	Classification	License Number
Wray Plumbing 31656 ID-200 E Ponderay, ID 83852	15400 Plumbing	010819
Wray Plumbing 31656 ID-200 E. Ponderay, ID 83852	15100 Pipe Fitter + Process Piping	010819
Peterson Electric 5622 N. Myrtle St. Spokane, WA 99217	Electrician	023372

NOTES TO USER

1. This form must be included for all bids.

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BID BOND (PENAL SUM FORM)

Bidder Name: Simco Development Group LLC Address *(principal place of business)*: 10183 N Aero Dr. Unit 4 Hayden, ID 83835	**Surety** Name: Old Republic Surety Company Address *(principal place of business)*: PO Box 1635 Milwaukee, WI 53201 - 1635
Owner Name: City of Sandpoint Address *(principal place of business)*: 1123 Lake Street Sandpoint, ID 83864	**Bid** Project *(name and location)*: 2024 Lift Station Replacements Bid Due Date: **August 29 2024**
Bond Penal Sum: Five Percent of Amount Bid - 5% Date of Bond: August 26th, 2024	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder Simco Development Group LLC *(Full formal name of Bidder)* By:  *(Signature)* Name: Jason Simmons *(Printed or typed)* Title: Member Attest:  *(Signature)* Name: Taylor Tompke *(Printed or typed)* Title: PM	Surety Old Republic Surety Company *(Full formal name of Surety) (corporate seal)* By:  *(Signature) (Attach Power of Attorney)* Name: Liliana Castrejon Perez *(Printed or typed)* Title: Attorney-in-Fact Attest:  *(Signature)* Name: Taj Hoard-Sire *(Printed or typed)* Title: Witness
Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.	

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
   3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   3.2. All Bids are rejected by Owner, or
   3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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OLD REPUBLIC SURETY COMPANY

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That OLD REPUBLIC SURETY COMPANY, a Wisconsin stock insurance corporation, does make, constitute and appoint:

Liliana Castrejon Perez

its true and lawful Attorney(s)-in-Fact, with full power and authority for and on behalf of the company as surety, to execute and deliver and affix the seal of the company thereto (if a seal is required), bonds, undertakings, recognizances or other written obligations in the nature thereof, ***(other than bail bonds, bank depository bonds, mortgage deficiency bonds, mortgage guaranty bonds, guarantees of installment paper and note guaranty bonds, self-insurance workers compensation bonds guaranteeing payment of benefits, or black lung bonds),*** as follows:

ALL WRITTEN INSTRUMENTS

Principal: Simco Development Group LLC
Obligee: City of Sandpoint

and to bind OLD REPUBLIC SURETY COMPANY thereby, and all of the acts of said Attorneys-in-Fact, pursuant to these presents, are ratified and confirmed. This appointment is made under and by authority of the board of directors at a special meeting held on February 18, 1982.

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following resolutions adopted by the board of directors of the OLD REPUBLIC SURETY COMPANY on February 18,1982.

RESOLVED that, the president, any vice-president or assistant vice president, in conjunction with the secretary or any assistant secretary, may appoint attorneys-in-fact or agents with authority as defined or limited in the instrument evidencing the appointment in each case, for and on behalf of the company to execute and deliver and affix the seal of the company to bonds, undertakings, recognizances, and suretyship obligations of all kinds; and said officers may remove any such attorney-in-fact or agent and revoke any Power of Attorney previously granted to such person.

RESOLVED FURTHER, that any bond, undertaking, recognizance, or suretyship obligation shall be valid and binding upon the Company

(i) when signed by the president, any vice president or assistant vice president, and attested and sealed (if a seal be required) by any secretary or assistant secretary; or

(ii) when signed by the president, any vice president or assistant vice president, secretary or assistant secretary, and countersigned and sealed (if a seal be required) by a duly authorized attorney-in-fact or agent; or

(iii) when duly executed and sealed (if a seal be required) by one or more attorneys-in-fact or agents pursuant to and within the limits of the authority evidenced by the Power of Attorney issued by the company to such person or persons.

RESOLVED FURTHER that the signature of any authorized officer and the seal of the company may be affixed by facsimile to any Power of Attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligations of the company; and such signature and seal when so used shall have the same force and effect as though manually affixed.

IN WITNESS WHEREOF, OLD REPUBLIC SURETY COMPANY has caused these presents to be signed by its proper officer, and its corporate seal to be affixed this 20th day of September, 2022.

OLD REPUBLIC SURETY COMPANY

Karen J. Haffner
Assistant Secretary

Alan Paylic
President

STATE OF WISCONSIN, COUNTY OF WAUKESHA - SS

On this 20th day of September, 2022, personally came before me, Alan Paylic and Karen J Haffner, to me known to be the individuals and officers of the OLD REPUBLIC SURETY COMPANY who executed the above instrument, and they each acknowledged the execution of the same, and being by me duly sworn, did severally depose and say: that they are the said officers of the corporation aforesaid, and that the seal affixed to the above instrument is the seal of the corporation, and that said corporate seal and their signatures as such officers were duly affixed and subscribed to the said instrument by the authority of the board of directors of said corporation.

Kathryn R. Pearson
Notary Public

My Commission Expires: September 28, 2026
(Expiration of notary's commission does not invalidate this instrument)

CERTIFICATE

I, the undersigned, assistant secretary of the OLD REPUBLIC SURETY COMPANY, a Wisconsin corporation, CERTIFY that the foregoing and attached Power of Attorney remains in full force and has not been revoked; and furthermore, that the Resolutions of the board of directors set forth in the Power of Attorney, are now in force.

Signed and sealed at the City of Brookfield, WI this 26th day of August, 2024.

Karen J. Haffner
Assistant Secretary

ORSC 22262 (3-06)

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Brad Little
Governor

State of Idaho

Division of Occupational and Professional Licenses

PUBLIC WORKS CONTRACTORS LICENSING

CONTRACTOR

028733 - AA - 1
License Number

12/14/2016
Original License Issued

This is to certify that

SIMCO DEVELOPMENT GROUP LLC

has fulfilled the requirements of the law relating to licensing in Idaho Code, Title 54, Chapter 19 & 45 and is hereby granted this certificate.

This license expires: 09/30/2024

Licensee Signature

Russell Barron, Administrator

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STATE OF IDAHO

Phil McGrane | Secretary of State
Business Office
450 North 4th Street
PO Box 83720
Boise, ID 83720

August 15, 2024

Request Type: Certificate of Existence/Filing
Request #: 0005862548
Receipt #: 001024638

Issuance Date: 08/15/2024
Copies Requested: 0

Regarding: **SIMCO DEVELOPMENT GROUP LLC**
Filing Type: Limited Liability Company (D)
Formation/Qualification Date: 08/01/2016
Status: Active-Existing
Duration Term: Perpetual

File # : 514991
Formation Locale: IDAHO
Inactive Date:

Certificate of Existence

I, Phil McGrane, Secretary of State of the State of Idaho, do hereby certify that effective as of the issuance date noted above

SIMCO DEVELOPMENT GROUP LLC

is a Limited Liability Company duly formed under the law of this State with a date of incorporation and duration as given above.

Phil McGrane
Idaho Secretary of State

Processed By: Business Division

Verification #: 030190825