

**VILLAGE SAFE WATER
WATER AND SEWER IMPROVEMENTS
VOZNESENKA, ALASKA**

**BID SET
PROJECT MANUAL**

August 2020



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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Voznesenka Water and Sewer Improvements
- B. Owner's Name: Village Safe Water.
- C. Engineer's Name: Kuna Engineering LLC.
- D. The Project consists of the construction of water system expansion into Falls Creek area. Includes a new 8-inch HDPE water main loop. Water main to connect adjacent to existing Hydrant 1. Water to run along East End Road, Falls Creek Road via Hermosa Drive and Linda Lane. . Water main to connect back into existing water main above Canyon View Road and East End Road.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price..

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.

1.04 ADEC PERMIT REQUIREMENTS

- A. Drinking water: The project is subject to ADEC Engineering Plan Review for work on the water treatment plant, water main, and appurtenances. All work shall follow the stipulations in the Approval to Construct letter.
- B. Onsite septic systems: the septic systems are subject to ADEC Notification requirements. Contractor shall submit the required notifications and copy the Engineer.
- C. ADEC Notification:
 - 1. Contractor shall notify Alaska Department of Conservation (ADEC) at least 24 hours in advance of beginning excavation to install any septic system.
 - 2. Notification Content:
 - a. Legal description, location of the property, and accurate directions to the site;
 - b. The physical address of the property including street name and house number;
 - c. Installer's name, certification number, phone number, and contractor's name and license number.
 - d. The scheduled date when the installation of the septic system will begin.
- D. Contractor to submit documentation of system construction to ADEC within 90 days after construction has been completed, for each septic system.
- E. Stormwater: Contractor shall obtain coverage under the Alaska Pollutant Discharge Elimination System (APDES) in accordance with the terms of the Alaska Construction General Permit (CGP).
- F. Reference Section 01 78 00 - Closeout Submittals for document requirements.

1.05 OWNER OCCUPANCY

- A. Owner intends to continue to occupy and operate the Water and Sewer Treatment Plant during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.

- B. Coordinate with the Owner prior to placement of equipment and supplies at the staging area. Do not disturb areas outside of the Owner's project boundaries.
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Do not disrupt access to adjacent areas unaffected by the Work. Keep driveways and entrances serving premises clear and available for use at all times. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner operations.
- D. Assume full responsibility for protection and safekeeping of products under this Contract.
- E. Assume full responsibility for the protection of existing facilities and contents, from damage due to construction operations.
- F. Utility Outages and Shutdown:
 - 1. No disruptions to WTP power or water production shall be allowed without written approval from the Owner and the Engineer. Under no circumstances shall the duration of any disruptions in service exceed 8 hours. Contractor shall be responsible for providing temporary services whenever necessary to prevent harm to City owned facilities throughout construction.
 - 2. Work with the Owner to schedule any disruptions for a time which minimizes impact on facility operations. Provide not less than 72 hour notice to Owner of activities that will affect building power, heat, or water treatment related operations.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.07 COORDINATION

- A. Coordinate construction schedule and operations with Owner.
- B. Coordinate Work to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
- C. Sequence Work to maximize worker efficiency and minimize construction time.
- D. Prior to procurement verify that characteristics of interrelated equipment are compatible.

1.08 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Section 01 20 00 - Price and Payment Procedures.
- B. Section 01 25 00 - Substitution Procedures.
- C. Section 01 30 00 - Administrative Requirements.
- D. Section 01 40 00 - Quality Requirements.
- E. Section 01 50 00 - Temporary Facilities and Controls.
- F. Section 01 60 00 - Product Requirements.
- G. Section 01 70 00 - Execution and Closeout Requirements.
- H. Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 10 00

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Contracting Forms and Supplements: VSW forms will be provided.
- B. Standard General Conditions of the Construction Contract.
- C. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form provided by VSW.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Engineer for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use the form provided by VSW.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Engineer for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. Include the following with the application:
 - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 - 3. Affidavits attesting to off-site stored products.

1.05 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Engineer will issue instructions directly to Contractor.
- C. For other required changes, Engineer will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.
- E. Contractor may propose a change by submitting a request for change to Engineer, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer.
 - 3. For change ordered by Engineer without a quotation from Contractor, the amount will be determined by Engineer based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

END OF SECTION 01 20 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- B. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- C. Standard General Conditions of the Construction Contract.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
 - 1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Engineer's, and Contractor's names.

- b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
- c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Warranties.
 - 5) Other salient features and requirements.
 - 6) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Certificates, test, reports or similar qualification data.
 - (c) Drawings, when required to show impact on adjacent construction elements.
- d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- E. Limit each request to a single proposed substitution item.
 - 1. Submit three hard-copies, bound and collated.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Engineer, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Engineer, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Engineer for any required redesign, time spent processing and evaluating the request.
 - b. Other unanticipated project considerations.
- D. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.

3. When acceptance will require revisions to Contract Documents.

3.03 RESOLUTION

- A. Engineer may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Engineer will notify Contractor in writing of decision to accept or reject request.
 1. Engineer's decision following review of proposed substitution will be noted on the submitted form.

3.04 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION 01 25 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Contractor's daily reports.
- G. Progress photographs.
- H. Coordination drawings.
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Requests for Interpretation (RFI) procedures.
- L. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Standard General Conditions of the Construction Contract.
- B. Section 01 60 00 - Product Requirements: General product requirements.
- C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AIA G716 - Request for Information; 2004.
- B. AIA G810 - Transmittal Letter; 2001.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Engineer:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.

- B. Attendance Required:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal schedule.
 - 6. Designation of personnel representing the parties to Contract.
 - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Scheduling.
 - 9. Traffic control.
- D. Record minutes and distribute PDF copies within two days after meeting to Engineer, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Schedule meeting at the Project site.
- B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Engineer.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Application for payment procedures.
 - 9. Procedures for testing.
 - 10. Procedures for maintaining record documents.
 - 11. Requirements for start-up of equipment.
 - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute PDF copies within two days after meeting to Engineer, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Engineer.
 - 4. Contractor's superintendent.

5. Major subcontractors.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Maintenance of quality and work standards.
 11. Effect of proposed changes on progress schedule and coordination.
 12. Other business relating to work.
- E. Record minutes and distribute PDF copies within two days after meeting to Engineer, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to Owner and Engineer, submit two printed copies at weekly intervals.
 1. Submit in format acceptable to Owner.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. Major equipment at Project site.
 5. Safety, environmental, or industrial relations incidents.
 6. Meetings and significant decisions.
 6. Description of work completed, with stations and other location references.
 7. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 8. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
 9. Testing and/or inspections performed.
 10. Signature of Contractor's authorized representative.

3.06 PROGRESS PHOTOGRAPHS

- A. Submit new photographs at least once a week, within 3 days after being taken.

- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Engineer.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Final completion, minimum of ten (10) photos.
- F. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Engineer for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.07 COORDINATION DRAWINGS

- A. Review drawings prior to submission to Engineer.

3.08 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 - 2. Prepare in a format and with content acceptable to Owner.
 - 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)

- c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
- 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
- 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Engineer, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 - 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 - 2. Owner's, Engineer's, and Contractor's names.
 - 3. Discrete and consecutive RFI number, and descriptive subject/title.
 - 4. Issue date, and requested reply date.
 - 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 - 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 - 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 - 2. Note dates of when each request is made, and when a response is received.
 - 3. Highlight items requiring priority or expedited response.
 - 4. Highlight items for which a timely response has not been received to date.
 - 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Engineer will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 - 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 - 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.

3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Engineer within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

- A. Submit to Engineer for review a schedule for submittals in tabular format.
 1. Submit at the same time as the preliminary schedule..
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Engineer for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Engineer's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.

- 5. ADEC Permits.
- 6. Other types as indicated.
- D. Final Property Survey.
- E. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size (the paper size the document was designed to print to) and right-side up; illegible files will be rejected.
- B. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 8-1/2 by 11 inches: Submit one copy; the Contractor shall make Contractor's own copies from original returned by the Engineer after making a file copy.
 - 2. Larger Sheets, Not Larger Than 36 by 48 inches: Submit one reproducible transparency and one opaque reproduction.
- C. Extra Copies at Project Closeout: See Section 01 78 00.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Engineer.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Engineer.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Deliver submittals to Engineer at business address.
 - 8. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 calendar days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Engineer's consultants, Owner, or another affected party, allow an additional 7 calendar days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Engineer's approval, allow an additional 30 calendar days.
 - 9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 10. Provide space for Contractor and Engineer review stamps.
 - 11. When revised for resubmission, identify all changes made since previous submission.
 - 12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 14. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal.
 4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.15 SUBMITTAL REVIEW

- A. Submittals for Review: Engineer will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Engineer will acknowledge receipt and review. See below for actions to be taken.
- C. Engineer's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Engineer's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - 2) Non-responsive resubmittals may be rejected.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Engineer's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Tolerances.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- B. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- C. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- D. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2018.

1.04 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary bracing.
 - 3. Investigation of soil conditions to support construction equipment.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Engineer if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1. Job Mix Design: As described in Section 32 12 16 - Asphalt Paving.
 - 2. Design of Structural Fill: As described in Section 31 23 23 - Fill.

1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Engineer's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include required product data and shop drawings.
 - 2. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. Test Reports: Within 24 hours after each test/inspection, submit two copies of report to Engineer and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.
 - 2. Test report submittals are for Engineer's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.08 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in Alaska.
- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
 - d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 2. Laboratory: Authorized to operate in Alaska.
 - 3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Engineer.
 - 7. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.

- c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
- 4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Engineer.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Engineer, it is not practical to remove and replace the work, Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION 01 40 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dewatering
- B. Temporary utilities.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers and enclosures.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Field offices.

1.02 DEWATERING

- A. Provide temporary means and methods for dewatering all temporary facilities and controls.
- B. Maintain temporary facilities in operable condition.

1.03 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.
- C. New permanent facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

1.07 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

- F. Do not allow vehicle parking on existing pavement.

1.08 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.10 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 calendar days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made outside the United States, its territories, Canada, or Mexico.
 - 2. Made using or containing CFC's or HCFC's.
 - 3. Containing lead, cadmium, or asbestos.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- F. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties ADEC permits, and bonds.
- G. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.
- B. ATM - Alaska Traffic Manual, available online at <http://www.dot.state.ak.us/stwddes/dcstraffic/resources.shtml>
- C. MUTCD - Manual on Uniform Traffic Control Devices, 2009 Edition with Revisions 1 and 2.
- D. ASDS - Alaska Sign Design Specifications
- E. SSCH - Alaska Department of Transportation Standard Specifications for Highway Construction, 2020 edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 2. Identify demolition firm and submit qualifications.
 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.
- F. Traffic Control Plan(s): Submit a Traffic Control Plan (TCP) for each phase of work that will obstruct part of any public road. Allow 7 calendar days for review of each TCP submittal. A minor revision to a previously approved TCP during construction requires 48 hours for review and approval by the Engineer. Schedule road closures to occur at least 14 calendar days after the date of written TCP approval.
- Include in each TCP:
1. Project name and number.
 2. A designated TCP number and name on each page.
 3. Each page must be numbered.
 4. The posted speed limit for each roadway.
 5. Existing striping width, lane width, and road surfacing.
 6. Construction lane widths, striping layout, and temporary pavement marker layout.
 7. Provisions for Pedestrian, Bicycle, and ADA travel through the work zone.
 8. Dates and times the TCP will be in effect and why it is being used.
 9. The Worksite Traffic Supervisor's signature signifying that all TCPs conform with the ATM and the Contract.
 10. The Project Superintendent's signature confirming the TCP is compatible with the work plan.
 11. The name(s) of the Worksite Traffic Supervisor, his/her alternate and their 24 hour telephone number(s).
 12. Signs to be used and the ASDS designation number and size.
 13. Location and spacing of all devised and signs.
 14. A plan to address any possible slopes, drop offs, paving joints, or similar temporary features that may occur during use of the TCP.
 15. For TCPs proposed to be used at night, note how the requirements will be met for the required lighting and retroreflective material.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For surveying work, employ a land surveyor registered in Alaska and acceptable to Engineer. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Alaska.
- D. The Worksite Traffic Supervisor shall be knowledgeable and experienced regarding the requirements of the ATM and the implementation of those requirements and certified as one of the following:
 1. Traffic Control Supervisor, American Traffic Safety Services Association (ATSSA)
 2. Work Zone Temporary Traffic Control Technician, or Work Zone Safety Specialist, International Municipal Signal Association (IMSA).

- E. Refer to Section 33 14 16 for pipe installer required qualifications. F. Refer to
Section 33 34 13 for septic system installer required qualifications.

1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- I. Traffic Maintenance:
 - 1. Keep the work, and portions of the project affected by the work, in good condition to accommodate traffic safely. Provide and maintain traffic control devices and services inside and outside the project limits, day and night, to guide traffic safely.
 - 2. Unless otherwise provided in this section, keep all roadways, business accesses, and pedestrian facilities within the project limits open to traffic. Obtain the Engineer's approval before temporarily closing residential, commercial, or street approaches. Provide access through the project for emergency vehicles and school and transit buses. Properly sign and/or flag all locations where the traveling public is redirected or stopped.
 - 3. Provide and maintain safe routes for pedestrians and bicyclists through or around traffic control zones at all times.
 - 4. Immediately notify the Engineer of any traffic related accident that occurs within the project limits as soon as an employee or subcontractor becomes aware of the accident.
 - 5. On East End Road: Patch pavement break(s), with hot mix asphalt, not more than 48 hours after removing the existing pavement.
 - 6. Traffic may be reduced to a single lane only if it is shown on an approved TCP for that phase of work.
 - 7. Trenches within the roadway shall be backfilled within the same shift that they are opened, unless shown on an approved TCP with provisions to ensure safe movement of traffic.
 - 8. There shall be no road or lane closures between 5 pm Friday and 8 am Monday, or on state or federal holidays.
- J. Water Flow Interruptions:
 - 1. Some work will involve service disruption to existing water customers. Interruptions shall be included on the project schedule (see 01 30 00).
 - 2. Contractor shall notify existing water customers of planned service interruptions at least 48 hours in advance. Notification shall be provided in writing, with notices left at each

house. Notices shall include the date and time the interruption will begin, the approximate date and time that it will end, and a name and phone number for a contact to address questions or concerns.

3. Interruptions not on the schedule, and changes to scheduled interruptions, require notifying the Engineer a minimum of 72 hours in advance. Interruptions not started within the planned interruption period require a new notification and 72-hour notice period to the Engineer and 48-hour notice period to affected customers.

1.07 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer four working days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute PDF copies within two working days after meeting to Engineer, Owner, participants, and those affected by decisions made.

3.03 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- G. Utilize recognized engineering survey practices.
- H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Repair areas adjacent to cuts to required condition.
 - 4. Remove samples of installed work for testing when requested.
 - 5. Remove and replace defective and non-complying work.

- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Prohibit traffic from landscaped areas.
- E. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer and Owner seven calendar days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.10 FINAL CLEANING

- A. Clean site; sweep paved areas, rake clean landscaped surfaces.
- B. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide two copies to Engineer and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer when work is considered ready for Engineer's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer when work is considered finally complete and ready for Engineer's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer listed in executed Certificate of Substantial Completion.

3.12 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

END OF SECTION 01 70 00

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
- E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- G. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Reuse: To reuse a construction waste material in some manner on the project site.
- J. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- K. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- L. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- M. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- N. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Recycled and Salvaged Materials: Include the following information for each:

- a. Identification of material, including those retrieved by installer for use on other projects.
- b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
- c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
- d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Engineer.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.
 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 3. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 4. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- G. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. ADEC Permit
- D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. ADEC Permit
 - 1. Submit documentation of system construction to ADEC within 90 days after construction has been completed, for each septic system. Provide one copy, in PDF format, to the Engineer. Request confirmation of receipt from ADEC and forward to the Engineer.
 - a. Submit information on the Documentation of Construction form available from ADEC at www.dec.alaska.gov/water.
 - b. Include at least four photographs of the installation with the following views:
 - 1) Septic tank with inlet or outlet exposed and capacity label showing;
 - 2) Open excavation of absorption field and line leading to it;
 - 3) Installed graveless chambers, prior to backfilling;
 - 4) Finished grading and landscaping with standpipes.
 - c. Include test hole and percolation test results (provided by Engineer).
 - d. Mark up the relevant Plans to reflect as-built conditions, and include in the submittal.
 - e. Include any additional information required on the latest version of the Documentation of Construction Instructions.
- D. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 2. Field changes of dimension and detail.
 3. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Additional Requirements: As specified in individual product specification sections.

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- F. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- G. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- H. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- I. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Table of Contents, of all volumes, and of this volume.
 - 2. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.05 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION 01 78 00

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Decommissioning of private wells.
- C. Decommissioning of private septic systems (or septic cribbage).

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Sequencing and staging requirements.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.
- G. Section 31 22 00 - Grading: Topsoil removal.
- H. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- I. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.
- C. Alaska Best Management Practices: Maintaining or Decommissioning Water Wells and Boreholes. Available online at <https://dec.alaska.gov/eh/dw/dwp/private-wells.aspx>
- D. ANSI/AWWA A100 - Decommissioning of Test Holes, Partially Completed Wells, and Abandoned Completed Wells.
- E. ASTM D 4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material Test Cylinders.
- F. AASHTO T 89 - Determining the liquid Limit of Soils.
- G. AASHTO T 90 - Determining the Plastic Limit and Plasticity Index of Soils.
- H. AASHTO T 27/T 11 - Sieve Analysis of Aggregates and Soils.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.

2. Identify demolition firm and submit qualifications.
 3. Include a summary of safety procedures.
- D. Pre-Decommissioning Examination Report: Inspect the wells and septic systems that are noted to be decommissioned. Submit a report to the Engineer at least 14 calendar days before decommissioning work is scheduled to begin. Include the following information:
1. Date of inspection
 2. Name of person writing the report. Names of others conducting the inspection.
 3. For each well or septic tank: Describe any conditions that are different from what is shown on the plans.
 4. For each well or septic tank: Describe any nonstandard or atypical conditions that complicate the specified decommissioning method. Describe recommended modifications to the decommissioning method (of any). Indicate if/how the recommended change will affect the project schedule or cost.
 5. For each well or septic tank: Describe any conversations with the homeowner regarding the construction or history of the facility.
- E. Flowable Fill Mix Design. Include the following information:
1. Certification of compliance to the mix design requirements of this specification.
 2. Certification of compliance of the component materials used in the mix design relative to this specification and referenced specifications.
 3. Representative gradations for aggregate and proposed gradation limits for aggregates to be used in the flowable fill.
 4. Performance characteristics of the hardened flowable fill to include compressive strength of specimens. Tests for compressive strength shall be reported for ages of 1-day, 7-days, and 28-days.
 5. Unit weight of all compressive strength specimens at time of testing and corresponding average unit weight.
- F. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 22 00 - Grading.
- B. Flowable Fill (Slurry): Non-segregating, free flowing, self-consolidating, and low shrink slurry with a minimum unconfined compressive strength at 28 days of 100 psi as determined in accordance with ASTM D 4832. The Contractor and supplier shall determine the materials and proportions used to meet the requirements of these specifications.
- C. Flowable Fill Sand: Sand containing no muck, frozen material, roots, sod, or other deleterious matter and with a plasticity index not greater than 6 as tested by AASHTO T 89 and T 90. Meet the following gradation as tested by AASHTO T 27/T 11:
 1. Percent passing No. 4 sieve: 100% (by weight)
 2. Percent passing No. 200 sieve: 0-6% (by weight)
- D. Bentonite slurry: a high-solids mixture of bentonite particles and water with a consistency of 18-30 percent solids. Shall be certified by NSF/ANSI for use as grout in water wells.

PART 3 EXECUTION

3.01 SCOPE

- A. Remove paving as required to accomplish new work.
- B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.
- C. Decommission private wells as indicated in the Homeowner Agreements.
- D. Decommission septic cribbage as indicated on the plans.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 70 00.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Provide, erect, and maintain temporary barriers and security devices.
 - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 6. Do not close or obstruct roadways or sidewalks without permit.
 - 7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- E. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

3.05 WELL DECOMMISSIONING

- A. Work shall follow Alaska Best Management Practices: Maintaining or decommissioning water wells and boreholes and conform to the standards in ANSI/AWWA A100. Wells are type: open annular space.
- B. Cap the service line from the well to the house.
- C. Remove all internal well and pump parts, wiring, accessories, and other obstructions in the well.

- D. Remove the liner.
- E. Fill the well with bentonite grout slurry from the bottom to 15 feet below ground surface (BGS).
- F. At 15 feet BGS, install a plug of bentonite chips or pellets, slowly poured in a bridge-free manner, up to the depth where the casing is to be cut off and capped.
- G. Cut off the well casing 2 feet BGS and seal with either:
 - 1. A 0.250-inch thick plate welded to the casing completely around its circumference, or
 - 2. A watertight well seal that is compression bolted on to the casing.
- H. Pour one 50-pound sack of bentonite granules around and over the sealed casing.
- I. Backfill with Borrow, Type C as defined in Section 31 23 23.
- J. Cover with 3 inches of topsoil per section 31 22 00 and seed the surface per section 32 92 19.

3.06 SEPTIC DECOMMISSIONING

- A. Pump the liquid and sludge from the structure into a watertight container. Transport and dispose of at an approved sanitary sewer dump station. Care is to be exercised to avoid spillage during transport and disposal.
- B. Fill the void in the tank with flowable fill.
- C. Show the abandoned system on the record drawings and in the Documentation of Construction form to be submitted to ADEC.

END OF SECTION 02 41 00

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections within Water Treatment Plant.
 - 1. Domestic water.
 - 2. Flanges, unions, and couplings.
 - 3. Pipe hangers and supports.
 - 4. Valves.

1.02 RELATED REQUIREMENTS

- A. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

- A. ASME B31.9 - Building Services Piping; 2017.
- B. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- C. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.
- D. ASTM A182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service.
- E. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- F. ASTM A403 - Standard Specification for Wrought Austenitic Stainless Steel Pipe Fittings
- G. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- H. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter; 2012a.
- I. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.
- J. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- L. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- N. AWWA C651 - Disinfecting Water Mains.
- O. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.
- P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- Q. MSS SP-67 - Butterfly Valves; 2017.
- R. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- S. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.
- D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- E. Sustainable Design Documentation: For products meeting regulatory lead-content restrictions.
- F. Project Record Documents: Record actual locations of valves.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Valve Repacking Kits: One for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe Fittings: AWWA C110/A21.1
- B. Polyethylene Pipe: ASTM D2239
- C. PVC Pipe: ASTM D1785.
 - 1. Fittings: ASTM D2665, PVC.
 - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- C. Stainless Steel Pipe: ASTM A321/A312M, grade TP304.
 - 1. Fittings: ASTM A403/A403M.
 - 2. Flanges: ASTM A182/A182M.

2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Flanges for Pipe Size Over 1 Inch:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.

2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
4. Gasket Material: Nitrile rubber suitable for operating temperature range from minus 20 degrees F to 180 degrees F.
5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
6. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - a. Cold and Hot Pipe Sizes 6 Inches and Over: Double hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping - Water:
 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 7. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 10. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.05 BUTTERFLY VALVES

- A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.06 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches:
 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- B. Over 2 Inches:
 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Install water piping to ASME B31.9.
- M. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- N. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Support cast iron drainage piping at every joint.
- O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 33 01 10.58.

- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If disinfectant residual tests less than 25 mg/L after 24 hours, repeat treatment.
- H. After treatment is complete, flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.05 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inches to 2 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inches to 3 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - d. Pipe Size: 4 inches to 6 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.
 - e. Pipe Size: 8 inches to 12 inches:
 - 1) Maximum hanger spacing: 14 ft.
 - 2) Hanger Rod Diameter: 7/8 inch.
 - f. Pipe Size: 14 inches and Over:
 - 1) Maximum Hanger Spacing: 20 ft.
 - 2) Hanger Rod Diameter: 1 inch.
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION 22 10 05

SECTION 22 37 00
VARIABLE SPEED PUMPING PACKAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable Speed Pumping Package.
- B. Pump Control Panel
- C. Variable Frequency Drive
- D. Sensor Transmitters
- E. Sequence of Operation

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AWWA - American Water Works Association.
- B. ANSI - American National Standards Institute.
- C. ASTM - American Standards for Testing Materials
- D. HI - Hydraulic Institute STM - American Standards for Testing Materials.
- E. ASME - American Society of Mechanical Engineers
- F. UL - Underwriters Laboratories
- G. ISO - International Standards Organization
- H. NEMA - National Electrical Manufacturers Association
- I. ETL - Electrical Testing Laboratories
- J. CSA - Canadian Standards Association
- K. NEC - National Electrical Code
- L. IEC - International Electrotechnical Commission
- M. NSF - NSF International

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of Pumping Package with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide:
 - 1. System summary sheet.
 - 2. Sequence of operation.
 - 3. Pump data sheet.
 - 4. Power and control wiring diagrams.
- C. Shop Drawings: Indicate dimensions, required clearances and location and size of each field connection.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Design Data: System profile analysis including variable speed pump curves and system curve. The analysis shall also include pump, motor, pump efficiencies, horsepower and kilowatt/hour consumption.
- F. Installer's Qualification Statement.
- G. Maintenance Contracts.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Project Record Documents: Record actual locations of pumping package.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. The pumping package shall be assembled by the pump manufacturer. An assembler of pumping systems not actively engaged in the design and construction of centrifugal pumps shall not be considered a pump manufacturer. The manufacturer shall assume "Unit Responsibility" for the complete pumping package. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system manufacturer.
- D. Contractor shall comply with all sections of this specification relating to packaged pumping systems. Any deviations from this specification shall be bid as a voluntary alternate clearly defined in writing. If no exceptions are noted, the supplier or contractor shall be bound by these specifications.
- E. The pumping package shall be certified by an approved independent testing and certification organization as being compliant with the requirements of NSF/ANSI 61 for potable drinking water and NSF-61 Annex G for low lead content.
- F. Manufacturer shall be listed by UL as a manufacturer of packaged pumping systems under UL/cUL category QCZJ.
- G. Manufacturer shall be listed by UL as a manufacturer of control panels under UL 508A.
- H. The manufacturer's production facility shall be certified by an approved independent testing and certification organization as being compliant with the requirements of NSF/ANSI 61 and NSF-61 Annex G. The manufacturing facility shall be subjected to periodic inspections and audits.
- I. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

- B. The manufacturer shall warrant the water pumping system to be free of defects in material and workmanship for one year (12 months) from date of authorized start-up, not to exceed eighteen (18) months from date of manufacturer's invoice. Complete terms and conditions will be provided upon request.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Goulds Water Technology
- B. Pre-approved equal
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED UNITS

- A. Furnish and install as shown on the plans an AquaForce Variable Speed Booster System as manufactured by Goulds Water Technology or approved equal. Suction and discharge headers shall be constructed of 304 series stainless steel.
- B. The entire pumping package shall be NSF/ANSI/NSF-61 certified for potable drinking water and NSF-61 Annex G for a wetted area, weighted average lead content = 0.25%
- C. The control system shall include, as a minimum, the programmable logic station controller, variable frequency drives, a manifold mounted 4-20ma pressure transducer and any additional equipment as specified or as required to properly execute the sequence of operation.
- D. System shall require only suction, discharge and drain connections and single point power connections from a service entrance disconnect.
- E. All components shall be mounted and shipped as a single unit.
- F. The discharge of each pump shall be fitted with a control valve appropriate for station operation. Each pump and discharge valve assembly shall also be equipped with isolation valves so that the pump can be serviced while system is still filled.
- G. Pressure gauges shall be installed on the suction and discharge headers.
- H. Piping shall be sized so that water velocity shall not exceed 10.0 ft/sec in either the branches or manifolds.
- I. Pumps shall be protected from thermal accumulation via individual thermal relief mechanisms.

2.03 COMPONENTS

- A. Pumps
 - 1. Two pumps shall be provided on booster pump skid.
 - 2. Pumps shall have 3 stages each.
 - 3. Mechanical seal material shall be Carbon/Silicon Carbon/Viton.
 - 4. Pump casing shall be of cast iron construction with 304SS internals.
 - 5. Pump operating point shall be set at 23 GPM at 74 ftH₂O
- B. Logic Controller
 - 1. Logic controller assembly shall be listed by and bear the label of Underwriter's Laboratory, Inc. (UL/cUL). The controller shall be specifically designed for packaged pressure booster applications.
 - 2. The pump logic controller shall be microcomputer based and hold its software in flash memory. On-line field modified data entries, such as stage point, alternation, serial communication, and sensor setup, as a minimum, shall be stored in non-volatile memory with capability to prevent accidental loss of data due to voltage surge or spike. In the event of a complete power outage, all factory preset or last saved data values remain stored and available for recall by the operator.
 - 3. The variable speed pump controller shall function to a proven program that safeguards the pumps/system against damaging hydraulic conditions including:
 - a. Motor Overload
 - b. Pump Flow Surges

- c. Hunting
 - d. Integral Curve Limiting Feature: The pump logic controller shall automatically protect the system from overload through frequency/current optimization.
4. The pump logic controller shall be capable of accepting individual analog inputs from zone sensor/transmitters as indicated on the plans. Analog input resolution shall be 12-bit minimum, and the controller shall scan each analog input a minimum of once every 100 milliseconds. Use of a multiplexer for multiple sensor inputs is not acceptable. All sensor/transmitter inputs shall be individually wired to the pump logic controller for continuous scan and comparison function. All analog inputs shall be provided with current limit circuitry to provide short circuit protection and safeguard against incorrect wiring of sensors.
 5. Hydraulic stabilization program shall utilize a proportional-integral-derivative control function. The proportional, integral and derivative values shall be user adjustable over an infinite range. The scan and compare rate that selects the command set point and process variable signal shall be continuous and automatically set for optimum performance. Each sensor shall be scanned at least once every 100 milliseconds.
 6. The pump logic controller shall be self-prompting. All messages shall be displayed in plain English. The following features shall be provided: Multi-fault memory and recall On-screen help functions LED pilot lights and switches Soft-touch membrane keypad switches.
 7. The variable speed pumping controller shall be provided with a user friendly operator interface complete with membrane switches and numeric keypad. Display shall be no less than four lines with each line capable of displaying up to twenty characters. The human interface panel shall display the following values:
 - a. Pump On/Off Status
 - b. Pump % Speed
 - c. Individual Alarm Conditions
 - d. Troubleshooting Diagnostics
 - e. User-adjustable parameters such as alternation, PID, set points, etc.
 8. The system shall utilize the QuickStart feature to simplify programming and startup of the pump control system. The feature shall be specific to pump systems and use suitable pump terminology.
 9. A data-logging feature shall be provided as a function of the pump logic controller. The Alarm log shall include the last 40 alarms with date/time stamp. The Pump data log shall display individual pump run timers and pump cycle counters. A Signal log shall be provided to display the maximum and minimum values with date/time stamps for each process variable.
 10. The Logic Controller shall incorporate a Flash Memory for saving and reloading customized settings. These field determined values shall be permanently retained in Flash memory for automatic reloading of the site specific setup values in the event of data corruption due to external disturbances. The Controller shall also employ a sensor setup copy feature.
 11. The pump controller shall be capable of communicating with the Building Automation System (BAS) by both hard-wired and serial communications. The following communication features shall be provided to the BAS in 'hard wired' form via 4-20ma analog output signals and digital input/outputs:
 - a. Remote system start/stop (dry contact supplied by BAS).
 - b. General Alarm (qty. 1, relay output from pump controller).
 - c. Process variable or VFD speed (qty. 1 4-20mA analog output supplied by pump controller).
 - d. System on/off status (qty. 1 relay output supplied by pump controller).
 12. The following communication features shall be provided to the Building Automation System via an onboard RS-485 port utilizing Modicon Modbus protocol:
 - a. All sensor process variables.
 - b. Individual zone set points.

- c. Individual pump failure.
 - d. Individual pump on/off status.
 - e. Individual VFD on/off status.
 - f. VFD speed.
 - g. Individual VFD Failure
 - h. Individual sensor failure.
- 13. Enclosure shall be NEMA 1 with NEMA 4 rated operator interface.
 - 14. Dynamic Flow Loss Compensation: To maximize energy efficiency, the controller shall be capable of using algorithms to simulate operational control, as if using a sensor located at the critical fixture, such that the friction loss associated with varying flow through the system is compensated for by corresponding set point adjustments. As flow increases, the pressure losses due to friction in the system will increase accordingly. This feature will allow controller to modify the set-point in real time based on the speed changes to compensate system friction loss. The use of a flow meter is not required. The controller will log the last 40 real time setpoint changes.
- C. Variable Frequency Drive
- 1. Description
 - a. This specification covers complete variable frequency drives (VFDs) designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD panel.
 - b. The VFD shall be rated NEMA 1 or NEMA 12 as required on the schedule. The VFD shall have been evaluated by UL and found acceptable for mounting in a plenum or other air handling compartment. Manufacturer shall supply a copy of the UL plenum evaluation upon request.
 - c. The VFD shall be tested to UL 508C. The appropriate UL label shall be applied. When the VFDs are to be located in Canada, C-UL certifications shall apply. VFD shall be manufactured in ISO 9001, 2000 certified facilities.
 - d. The VFD shall be CE marked and conform to the European Union ElectroMagnetic Compatibility directive.
 - e. The VFD shall be UL listed for a short circuit current rating of 100 kA and labeled with this rating.
 - f. The VFD manufacturer shall supply the VFD and all necessary controls as herein specified.
 - 2. Components
 - a. The VFD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor de-rating.
 - b. When properly sized, the VFD shall allow the motor to produce full rated power at rated motor voltage, current, and speed without using the motor's service factor. VFDs utilizing sine weighted/ coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
 - c. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental (displacement) power factor near unity regardless of speed or load.
 - d. The VFD shall have a dual 5% impedance DC link reactor on the positive and negative rails of the DC bus to minimize power line harmonics and protect the VFD from power line transients. The chokes shall be non-saturating. Swinging chokes that do not provide full harmonic filtering throughout the entire load range are not acceptable. VFDs with saturating (non-linear) DC link reactors shall require an additional 3% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.

- e. The VFD's full load output current rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 120% of rated torque for up to 0.5 second while starting.
 - f. A programmable automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continuously monitor the motor's speed and load to adjust the applied voltage to maximize energy savings.
 - g. Output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD.
 - h. An automatic motor adaptation algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to perform the test.
 - i. Galvanic isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete digital I/O shall include additional isolation modules.
 - j. VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency.
 - k. The carrier frequency shall be automatically adjusted to optimize motor and VFD operation while reducing motor noise. VFDs with fixed carrier frequency are not acceptable.
3. Protective Features
- a. A minimum of Class 20 I2t electronic motor overload protection for single motor applications shall be provided. Overload protection shall automatically compensate for changes in motor speed.
 - b. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain language. Codes are not acceptable.
 - c. Protect VFD from input phase loss. The VFD should be able to protect itself from damage and indicate the phase loss condition. During an input phase loss condition, the VFD shall be able to be programmed to either trip off while displaying an alarm, issue a warning while running at reduced output capacity, or issue a warning while running at full commanded speed. This function is independent of which input power phase is lost.
 - d. Protect from under voltage. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output, without faulting, with an input voltage as low as 70% of the nominal voltage.
 - e. Protect from over voltage. The VFD shall continue to operate without faulting with a momentary input voltage as high as 130% of the nominal voltage.
 - f. The VFD shall incorporate a programmable motor preheat feature to keep the motor warm and prevent condensation build up in the motor when it is stopped in a damp environment by providing the motor stator with a controlled level of current.
 - g. VFD shall include a "signal loss detection" algorithm with adjustable time delay to sense the loss of an analog input signal. It shall also include a programmable time delay to eliminate nuisance signal loss indications. The functions after detection shall be programmable.
 - h. VFD shall function normally when the keypad is removed while the VFD is running. No warnings or alarms shall be issued as a result of removing the keypad.
 - i. VFD shall catch a rotating motor operating forward or reverse up to full speed without VFD fault or component damage.
 - j. Selectable over-voltage control shall be provided to protect the drive from power regenerated by the motor while maintaining control of the driven load.
 - k. VFD shall include current sensors on all three output phases to accurately measure motor current, protect the VFD from output short circuits, output ground faults, and

act as a motor overload. If an output phase loss is detected, the VFD will trip off and identify which of the output phases is low or lost.

- l. If the temperature of the VFD's heat sink rises to 80 °C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. It shall also be possible to program the VFD so that it reduces its output current limit value if the VFD's temperature becomes too high.
 - m. In order to ensure operation during periods of overload, it must be possible to program the VFD to automatically reduce its output current to a programmed value during periods of excessive load. This allows the VFD to continue to run the load without tripping.
 - n. The VFD shall have temperature controlled cooling fan(s) for quiet operation, minimized losses, and increased fan life. At low loads or low ambient temperatures, the fan(s) may be off even when the VFD is running.
 - o. The VFD shall store in memory the last 10 alarms. A description of the alarm, and the date and time of the alarm shall be recorded.
 - p. When used with a pumping system, the VFD shall be able to detect no-flow situations, dry pump conditions, and operation off the end of the pump curve. It shall be programmable to take appropriate protective action when one of the above situations is detected.
- 4. Interior Features
 - a. Hand, Off and Auto keys shall be provided to start and stop the VFD and determine the source of the speed reference. It shall be possible to either disable these keys or password protect them from undesired operation.
 - b. There shall be an "Info" key on the keypad. The Info key shall include "on-line" context sensitive assistance for programming and troubleshooting.
 - c. The VFD shall be programmable to provide a digital output signal to indicate whether the VFD is in Hand or Auto mode. This is to alert the Building Automation System whether the VFD is being controlled locally or by the Building Automation System.
 - d. Password protected keypad with alphanumeric, graphical, backlit display can be remotely mounted. Two levels of password protection shall be provided to guard against unauthorized parameter changes.
 - e. All VFDs shall have the same customer interface. The keypad and display shall be identical and interchangeable for all sizes of VFDs.
 - f. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD's keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters. Keypad shall provide visual indication of copy status.
 - g. Display shall be programmable to communicate in multiple languages including English, Spanish and French.
 - h. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
 - i. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD. The VFD shall also have individual Fan, Pump, and Compressor menus specifically designed to facilitate start-up of these applications.
 - j. The VFD's PID controller shall be able to actively adjust its setpoint based on flow. This allows the VFD to compensate for a pressure feedback sensor which is located near the output of the pump rather than out in the controlled system.
 - k. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.
 - l. Five simultaneous meter displays shall be available. They shall include at a minimum, frequency, motor current, motor voltage, VFD output power, VFD output energy, VFD temperature in degrees, actual process variable and set point among others.

- m. Programmable Sleep Mode shall be able to stop the VFD. When its output frequency drops below set "sleep" level for a specified time, when an external contact commands that the VFD go into Sleep Mode, or when the VFD detects a no-flow situation, the VFD may be programmed to stop. When the VFD's speed is being controlled by its PID controller, it shall be possible to program a "wake-up" feedback value that will cause the VFD to start. To avoid excessive starting and stopping of the driven equipment, it shall be possible to program a minimum run time before sleep mode can be initiated and a minimum sleep time for the VFD.
 - n. A run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of initiating an output "run request" signal to indicate to the external equipment that the VFD has received a request to run.
 - o. VFD shall be programmable to display feedback signals in appropriate units, such as inches of water column (in-wg), pressure per square inch (psi) or temperature (°F).
 - p. VFD shall be programmable to sense the loss of load. The VFD shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. To ensure against nuisance indications, this feature must be based on motor torque, not current, and must include a proof timer to keep brief periods of no load from falsely triggering this indication.
5. Standard Inputs and Outputs
- a. Four dedicated, programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
 - b. Two terminals shall be programmable to act either as digital outputs or additional digital inputs.
 - c. Two programmable relay outputs, Form C 240 V AC, 2 A, shall be provided for remote indication of VFD status.
 - 1) Each relay shall have an adjustable on delay / off delay time
 - d. Two programmable analog inputs shall be provided that can be either direct-or-reverse acting.
 - 1) Each shall be independently selectable to be used with either an analog voltage or current signal.
 - 2) The maximum and minimum range of each shall be able to be independently scalable from 0 to 10 V dc and 0 to 20 mA.
 - 3) A programmable low-pass filter for either or both of the analog inputs must be included to compensate for noise.
 - 4) The VFD shall provide front panel meter displays programmable to show the value of each analog input signal for system set-up and troubleshooting
 - e. One programmable analog current output (0/4 to 20 mA) shall be provided for indication of VFD status. This output shall be programmable to show the reference or feedback signal supplied to the VFD and for VFD output frequency, current and power. It shall be possible to scale the minimum and maximum values of this output.
 - f. It shall be possible through serial bus communications to read the status of all analog and digital inputs of the VFD.
 - g. It shall be possible to command all digital and analog output through the serial communication bus.
 - h. Optional Control and Monitoring Inputs and Outputs
 - 1) It shall be possible to add optional modules to the VFD in the field to expand its analog and digital inputs and outputs.
 - 2) These modules shall use rigid connectors to plug into the VFD's control card.
 - 3) The VFD shall automatically recognize the option module after it is powered up. There shall be no need to manually configure the module.
 - 4) Modules may include such items as
 - (a) Additional digital outputs, including relay outputs
 - (b) Additional digital inputs

- (c) Additional analog outputs
 - (d) Additional analog inputs, including Ni or Pt temperature sensor inputs
- i. It shall be possible through serial bus communications to control the status of all optional analog and digital outputs of the VFD.
- j. Real-time clock shall be an integral part of the VFD.
- k. It shall be possible to use this to display the current date and time on the VFD's display.
- l. Ten programmable time periods, with individually selectable ON and OFF functions shall be available. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter setpoints and output relays. It shall be possible to program unique events that occur only during normal work days, others that occur only on non-work days, and others that occur on specific days or dates. The manufacturer shall provide free PC-based software to set up the calendar for this schedule.
- m. All VFD faults shall be time stamped to aid troubleshooting.
- n. It shall be possible to program maintenance reminders based on date and time, VFD running hours, or VFD operating hours.
- o. The real-time clock shall be able to time and date stamp all faults recorded in the VFD fault log.
- p. The VFD shall be able to store load profile data to assist in analyzing the system demand and energy consumption over time.
- q. The VFD shall include a sequential logic controller to provide advanced control interface capabilities. This shall include:
 - 1) Comparators for comparing VFD analog values to programmed trigger values
 - 2) Logic operators to combine up to three logic expressions using Boolean algebra
 - 3) Delay timers
 - 4) A 20-step programmable structure
- r. The VFD shall include a Cascade Controller which allows the VFD to operate in closed loop set point (PID) control mode one motor at a controlled speed and control the operation of 3 additional constant speed motor starters.
- 6. Serial Communications
 - a. The VFD shall include a standard EIA-485 communications port and capabilities to be connected to the following serial communication protocols at no additional cost and without a need to install any additional hardware or software in the VFD:
 - 1) Modbus RTU
 - b. The VFD shall have provisions for an optional 24 V DC back-up power interface to power the VFD's control card. This is to allow the VFD to continue to communicate to the building automation system even if power to the VFD is lost.
- 7. Adjustments
 - a. The VFD shall have a manually adjustable carrier frequency that can be adjusted in 0.5 kHz increments to allow the user to select the desired operating characteristics. The VFD shall also be programmable to automatically reduce its carrier frequency to avoid tripping due to thermal loading.
 - b. Four independent setups shall be provided.
 - c. Four preset speeds per setup shall be provided for a total of 16.
 - d. Each setup shall have two programmable ramp up and ramp down times. Acceleration and deceleration ramp times shall be adjustable over the range from 1 to 3,600 seconds.
 - e. Each setup shall be programmable for a unique current limit value. If the output current from the VFD reaches this value, any further attempt to increase the current produced by the VFD will cause the VFD to reduce its output frequency to reduce the load on the VFD. If desired, it shall be possible to program a timer which will cause the VFD to trip off after a programmed time period.

- f. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: external interlock, under-voltage, over-voltage, current limit, over temperature, and VFD overload.
 - g. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
 - h. An automatic "start delay" may be selected from 0 to 120 seconds. During this delay time, the VFD shall be programmable to either apply no voltage to the motor or apply a DC braking current if desired.
 - i. Four programmable critical frequency lockout ranges to prevent the VFD from operating the load at a speed that causes vibration in the driven equipment shall be provided. Semi-automatic setting of lockout ranges shall simplify the set-up.
- 8. Service Conditions
 - a. Ambient temperature, continuous, full speed, full load operation:
 - 1) -10 to 45°C (14 to 113°F) through 125 HP @ 460 and 600 volt, through 60 HP @ 208 volt
 - 2) -10 to 40°C (14 to 104°F) 150 HP and larger
 - b. 0 to 95% relative humidity, non-condensing.
 - c. Elevation to 3,000 feet without derating.
 - d. AC line voltage variation, -10 to +10% of nominal with full output.
 - e. No side clearance shall be required for cooling.
 - f. All power and control wiring shall be done from the bottom.
 - g. All VFDs shall be plenum rated.
- 9. Quality Assurance
 - a. To ensure quality, the complete VFD shall be tested by the manufacturer. The VFD shall drive a motor connected to a dynamometer at full load and speed and shall be cycled during the automated test procedure.
- 10. VFD shall utilize a full wave rectifier to convert three phase AC to a fixed DC voltage. Power factor shall remain above 0.98 regardless of speed or load. VFD's employing power factor correction capacitors shall not be acceptable.
- 11. An internal line reactor (5% impedance) shall be provided to lower harmonic distortion of the power line and to increase the fundamental power factor.
- 12. The VFD shall be suitable for elevations to 3300 feet above sea level without derating. Maximum operating ambient temperature rating shall not be greater than 104°F. VFD shall be suitable for operation in environments up to 95% non-condensing humidity.
- 13. The VFD shall be capable of displaying the following information in plain English via an alphanumeric display:
 - a. Output Frequency
 - b. Output Voltage
 - c. Motor Current
 - d. Kilowatts per hour
 - e. Fault identification with text
 - f. Percent torque
 - g. Percent power
 - h. RPM
- 14. The VFD shall have the ability to automatically restart after an over-current, overvoltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable.
- 15. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
- 16. Operator Control Panel (Keypad)
 - a. Each VFD shall be equipped with a front mounted operator control panel (keypad) consisting of a backlit, alphanumeric, graphic display and a keypad with keys for Start/Stop, Local/Remote, Up/ Down and Help. Two (2) Softkeys will be provided which change functionality depending upon the position within the parameter hierarchy or state of panel.

- b. All parameter names, fault messages, warnings and other information shall be displayed in complete English words or Standard English abbreviations to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
 - c. The Display shall have contrast adjustment provisions to optimize viewing at any angle.
 - d. The control panel shall provide a real time clock for time stamping events and fault conditions.
 - e. The control panel shall include a feature for uploading parameter settings to control panel memory and downloading from the control panel to the same Drive or to another Drive.
 - f. All Drives throughout the entire power range shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating.
 - g. The keypad shall be able to be installed or removed from the drive while it is powered, capable of remote mounting, and shall have its own non-volatile memory.
17. Protective Functions
- a. For each programmed warning and fault protection function, the Drive shall display a message in complete English words or Standard English abbreviations. The three (3) most recent fault messages along with time, current, speed, voltage, frequency and DI Status shall be stored in the Drive's fault history. The last ten (10) fault names shall be stored in Drive Memory.
 - b. The Drive shall include internal MOV's for phase to phase and phase to ground line voltage transient protection.
 - c. Output short circuit withstand rating and ground fault protection rated for 100,000 AIC shall be provided per UL508C without relying on line fuses. Motor phase loss protection shall be provided.
 - d. The Drive shall provide electronic motor overload protection qualified per UL508C.
 - e. Protection shall be provided for AC line or DC bus overvoltage at 130% of maximum rated or under voltage at 65% of min. rated and input phase loss.
 - f. A power loss ride through feature will allow the Drive to remain fully operational after losing power as long as kinetic energy can be recovered from the rotating mass of the motor and load.
18. Integrated Drive Disconnects
- a. 3-Phase: Individual integrated drive fused disconnects shall have exterior operators.
 - b. Single-Phase: Individual integrated drive disconnects shall have exterior operators and external fusing
19. Variable Speed System Sequence of Operation
- a. The system shall consist of a pump logic controller with multi-pump parallel operation control, duty-standby pump selection, automatic alternation and automatic transfer to the standby pump upon pump/VFD failure.
 - b. The pumping system shall start upon the closure of customer's contact when the pump logic controller Mode of Operation is in REMOTE.
 - c. When the pump logic controller mode in LOCAL, the pumping system shall operate automatically.
 - d. Each sensor/transmitter shall send a 4-20mA signal to the pump logic controller, indicative of process variable condition.
 - e. When the set point is satisfied by the process variable, the pump speed shall remain constant at the optimum energy consumption level.
 - f. When the process variable exceeds the allowable drift from the set point for a set time the pump controller shall automatically start the next lag pump and continue in this fashion as necessary to satisfy system demand. To maintain system set point the controller will operate the pumps synchronously or sequentially to ensure maximum energy conservation.
 - g. As demand is satisfied, the controller shall automatically stop lag pumps as necessary to conserve energy.

- h. In the event of a pump failure or a VFD fault, the pump logic controller automatically initiates a timed sequence of operation to start the redundant pump/VFD set in the variable speed mode.
 - i. In the event of the failure of a zone sensor/transmitter, its process variable signal shall be removed from the scan/compare program. The redundant zone sensor/transmitters, if available, shall remain in the scan/compare program for control.
 - j. PUMP or VFD hard fault shall be flash continuously on the display on the operator interface of the pump logic controller until the fault has been corrected and the controller has been manually reset.
 - k. When the system is satisfied, the pump controller shall shut down the single running lead pump without the need of a flow sensor/switch or hydropneumatic tank and enter energy saving / no flow shutdown mode.
20. Electrical
- a. Pump Logic Controller Enclosure. Main station disconnect shall have a through door operator and shall be sized as shown in the technical data sheet. Individual integrated fusible drive disconnects shall have exterior operators, and shall be sized as shown in the technical data sheet. Station disconnect panel shall be housed in a NEMA 1 enclosure with integral latches. The control enclosure shall be constructed of 14-gauge steel and the back plate assembly shall be constructed of 14-gauge steel.
 - b. Controls and Enclosure. The control panel with controls shall be built in accordance with NEC, and shall comply with UL standards. Pump station manufacturer shall be authorized under UL508A to manufacture its own control panels. All equipment and wiring shall be mounted within the enclosure and each device shall be labeled with proper identification. All adjustments and maintenance shall be accessible from the front of the control enclosure. A complete wiring circuit diagram and legend with terminals, components, and wiring completely identified shall be provided. Main disconnect shall be interlocked with door.
 - c. c. Station shall have a short circuit current rating (SCCR) OF 5000A
21. Sensor/Transmitters
- a. Pressure transducer shall be utilized for providing all pressure signals for the pump control logic.
 - b. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of $< \pm 0.5\%$ BFSL and constructed of 316 stainless steel. Transducer shall be rated for a pressure of 300 psi and shall provide gauge pressure output, rather than an absolute. Pressure transducer constructed of plastic is not acceptable. Pressure transducer shall be 4-20mA analog type with 10-28 VDC supply range shall utilize a packard type connector to prevent moisture intrusion and include surge protection against voltage spikes
22. Flowmeter, when specified and shown in the plans
- a. Provide a field mounted flow sensor transmitter as indicated on the plans. Unit shall transmit an isolated 4-20 mA dc signal indicative of process variable to the pump logic controller via standard two wire 24 VDC system. Unit shall consist of an insertion probe and separately mounted transmitter. The unit shall be accurate to within 1% of flow rate from 1.0 ft/sec to 30.0 ft/sec and shall withstand a static pressure of 200.0 psi g with negligible change in output.
23. Variable Speed System Sequence of Operation
- a. The system shall consist of a Technologic 1500 pump logic controller with multi-pump parallel operation control, duty-standby pump selection, automatic alternation and automatic transfer to the standby pump upon pump/VFD failure.
 - b. The pumping system shall start upon the closure of customer's contact when the pump logic controller Mode of Operation is in REMOTE.
 - c. When the pump logic controller mode in LOCAL, the pumping system shall operate automatically.

- d. Each sensor/transmitter shall send a 4-20mA signal to the Technologic 1500 pump logic controller, indicative of process variable condition.
 - e. When the set point is satisfied by the process variable, the pump speed shall remain constant at the optimum energy consumption level.
 - f. The pump controller shall automatically start the lag pumps as necessary to satisfy system demand.
 - g. As demand is satisfied, the controller shall automatically stop lag pumps as necessary to conserve energy.
 - h. In the event of a pump failure or a VFD fault, the pump logic controller automatically initiates a timed sequence of operation to start the redundant pump/VFD set in the variable speed mode.
 - i. In the event of the failure of a zone sensor/transmitter, its process variable signal shall be removed from the scan/compare program. The redundant zone sensor/transmitters, if available, shall remain in the scan/compare program for control.
 - j. PUMP or VFD fault shall be continuously scrolled through the display on the operator interface of the pump logic controller until the fault has been corrected and the controller has been manually reset.
 - k. When the system is satisfied, the pump controller shall shut down the single running lead pump and enter energy saving / no flow shutdown mode.
- D. Station Frame
- 1. The pump station frame shall be designed and fabricated to provide structural support for all attached equipment, and provide anchor bolt support. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off loading, installation, and operation.
- E. Manifolds
- 1. All piping shall be constructed from 304 stainless steel, schedule 10 or heavier pipe as required to maintain a 3 to 1 pressure safety factor (including 0.062 in corrosion allowance).
- F. Isolation Ball Valves
- 1. Isolation ball valves shall be certified to NSF-61 for use with potable drinking water.
 - 2. Isolation ball valves shall be certified as low lead having wetted surface area with a weighted average lead content < 0.25%.
 - 3. Valves shall be rated for 600.0 psig WOG / 150.0 psig WSP for valves 0.25 in to 2.0 in and 400.0 psig WOG / 125.0 psig WSP for valves 2.5 in to 4.0 in.
 - 4. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks.
 - 5. Valves shall be 2-piece full port design.
- G. Threaded Check Valves
- 1. All valve metallic components shall be 316SS.
 - 2. Seat shall be Viton.
 - 3. Valve shall be rated for 400.0 psig WOG
- H. Pressure Gauges
- 1. Gauges shall be provided for the suction and discharge manifold.
 - 2. Accuracy shall be $\pm 1.5\%$
 - 3. Bourdon tube and connection shall be constructed of 316SS.
 - 4. Case, bezel and internals shall be constructed of 316SS.
 - 5. Gauge shall be filled with glycerin in order to dampen pulsation and vibration and to provide lubrication to the internal parts.
 - 6. Gauge range shall be selected to cover the largest operating range for the specific conditions and pump selected.
- I. Flange Bolts. Bolts shall be zinc plated and shall meet ASTM Grade A193 B7.

- J. Paint. The finish coat shall be acrylic enamel to a thickness of no less than 3 mils.

PART 3 EXECUTION

3.01 DEMONSTRATION/TRAINING

- A. A. The system manufacturer's factory qualified representative shall be capable of providing optional start-up of the packaged pumping system. This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the owner or owner's designated representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed-off on the manufacturer's start-up request form.
- B. The system manufacturer's factory qualified representative shall be capable of providing on-site training for owner's personnel. This training shall fully cover maintenance and operation of all system components.
- C. The system manufacturer must have an optional complete pressure booster training program available for owner's personnel. The training sessions shall take place at the manufacturer's facility and cover all aspects of pressure booster system design, service and operation.

3.02 START UP SERVICES

- A. Owner start up assistance will be provided by a manufacturer qualified representative and will be limited to one 8-hour day, unless previously negotiated by the factory representative. When discharge piping, electrical connections, and electrical inspection have been completed, the pump station representative shall be contacted for start up. A minimum two-week notice shall be given to manufacturer representative prior to scheduled start up date. During start up, the complete pumping system shall be given a running test of normal start and stop, and fully loaded operating conditions. During this test, each pump shall demonstrate its ability to operate without undue vibration, or overheating, and shall demonstrate its general fitness for service. All defects shall be corrected and adjustments shall be made to the pumping station for satisfactory operation. System problems or concerns will be corrected by the general contractor or site station staff, in conjunction with the appropriate factory representative. Testing shall be repeated until satisfactory results are obtained, as determined by the Engineer.

3.03 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstrate proper operation of equipment to Owner's designated representative.
- C. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, and maintenance of each component.

3.04 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 22 37 00

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- D. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation removal limits.
 - 2. Areas for temporary construction and field offices.
 - 3. Erosion and Sediment Control Best Management Practices.

1.04 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 01 70 00.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be excavated for utilities.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the limits indicated on drawings.
 - 1. Exception: Specific trees and vegetation indicated on drawings to be removed.
 - 2. Exception: Selective thinning of undergrowth specified elsewhere.
- D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.

- E. In areas where vegetation must be removed but no construction will occur other than previous paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 10 00

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and replacement of topsoil.

1.02 RELATED REQUIREMENTS

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 23 16 - Excavation.
- C. Section 31 23 23 - Fill: Filling and compaction.
- D. Section 32 92 19 - Seeding: Finish ground cover.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil - Soil Type 1: Topsoil excavated on-site.
- B. Other Fill Materials: See Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- E. Protect site features to remain, including but not limited to benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

3.03 TOPSOIL REMOVAL

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. When excavating through roots, perform work by hand and cut roots with sharp axe.
- D. Stockpile topsoil to be re-used on site; remove remainder from site.
- E. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.04 TOPSOIL REPLACEMENT

- A. Before Finish Grading:
 - 1. Verify trench backfill has been inspected and tested.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

- E. Place topsoil during dry weather.
- F. Remove roots, weeds, rocks, and foreign material while spreading.
- G. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- H. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.05 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.06 FIELD QUALITY CONTROL

- A. See Section 31 23 23 for compaction density testing.

3.07 CLEANING

- A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 16 EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Trenching for utilities.
- B. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
- B. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.
- C. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.
- D. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Temporary Support and Excavation Protection Plan.
 - 1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
 - 2. Include drawings and calculations for bracing and shoring.
 - 3. Bracing and shoring design to meet requirements of OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
- C. Project Record Documents: Record drawings at project closeout according to 01 70 00 - Execution and Closeout Requirements. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Bedding and Fill:
 - 1. See Section 31 23 23 for bedding and backfill materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.
- B. Contact utilities for locates. Preserve the locates.
- C. For service lines, coordinate with the property owner to avoid digging up trees and other yard improvements.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 10 00 for clearing, grubbing, and removal of existing debris.
- C. See Section 31 22 00 for topsoil removal.
- D. Locate, identify, and protect utilities that remain and protect from damage.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Protect plants, lawns, rock outcroppings, and other features to remain.

- G. Use temporary perimeter controls to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.
- H. See Sections 01 70 00 and 02 41 00 for underpinning and shoring of adjacent structures that could be damaged by excavating work.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

- A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
 - 1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.
 - 2. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:
 - a. Sloping and benching systems.
 - b. Support systems, shield systems, and other protective systems.
- B. Excavation support and protection systems not required to remain in place may be removed subject to approval of Owner or Owner's Representative.
 - 1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.04 TRENCHING

- A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. At excavations outside of the road prism, save the vegetated mat to replace after construction.
- C. Excavation limits to be at least 10 ft. from power poles and guys wires.
- D. Slope banks of excavations deeper than 4 feet to angle of repose or flatter until shored.
- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Cut trenches wide enough to allow inspection of installed utilities.
- G. Hand trim excavations. Remove loose matter.
- H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- I. Remove lumped subsoil, boulders, and rock.
- J. Remove excavated material that is unsuitable for re-use from site.
- K. Remove excess excavated material from site.
- L. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- M. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.

3.05 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.06 FILLING AND BACKFILLING

- A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.
- B. See Section 31 23 23 for backfill and compaction requirements.
- C. See Section 31 22 00 for topsoil replacement requirements.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

3.08 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.

3.09 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water.

END OF SECTION 31 23 16

SECTION 31 23 23

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling and compacting for utilities

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.
- B. Section 31 23 16 - Excavation.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

- A. AASHTO T 96 - Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- B. AASHTO T 104 - Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- C. ATM - Alaska Test Methods Manual
- D. ATM 204 - Liquid Limit of Soils
- E. ATM 205 - Plastic Limit and Plasticity Index of Soils
- F. ATM 207 - Moisture-Density Relations of Soils
- G. ATM 212 - Standard Density of Course Granular Materials using the Vibratory Compactor
- H. ATM 213 - In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
- I. ATM 214 - Correction for Coarse Particles in the Soil Compaction Test
- J. ATM 304 - Sieve Analysis of Aggregates & Soils
- K. ATM 305 - Percentage of Fracture in Coarse Aggregate
- L. ATM 313 - Degradation Value of Aggregate

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Pipe Bedding - Class "E" Bedding
1. Coarse aggregate meeting the following gradation:

Sieve	Passing
1/2 in.	100%
3/8"	80-100%
No. 4	20-75%
No. 8	12-60%
No. 30	2-30%
No. 200	0-6%
 2. Wear shall not exceed 30 percent after 500 revolutions, as determined by the current requirements of AASHTO T 96.
- B. General Fill - Borrow, Type C: Subsoil excavated on-site.
1. Follows DOT&PF specification for Selected Material Type C.
 2. Earth, sand, gravel, rock, or combinations thereof containing no muck, peat, frozen material, roots, sod, or other deleterious matter and is compactable under the provisions of 31 23 23-3.02.
- C. Subbase, Grading C:
1. Follows DOT&PF specification for Subbase, Grading C.
 2. Hard, durable particles or fragments of stone or gravel. Do not use materials that break up when alternately frozen and thawed or wetted and dried. Do not include muck, frozen material, roots, sod, or other deleterious matter.
 3. Meet the following properties
 - a. L.A. Wear: 50%, max as tested per AASHTO T 96.
 - b. Liquid Limit: 25, max as tested per ATM 204
 - c. Plasticity Index: 6, max as tested per ATM 205
 - d. Degradation Value: 40, min. as tested by ATM 313
 4. Crushed aggregate with at least 50 percent by weight of the particles retained on the No. 4 sieve having at least one fractured face as tested by ATM 305.
 5. Meet the following gradation:

Sieve	Passing
1 in.	100%
No. 4	40-75%
No. 16	20-43%
No. 200	4-10%
- D. Subbase, Type I:
1. Follows Kenai Peninsula Borough (KPB) specification for Type I Material.
 2. Hard, durable particles or fragments of stone or gravel. Do not use materials that break up when alternately frozen and thawed or wetted and dried. Do not include muck, frozen material, roots, sod, or other deleterious matter.
 3. Crushed aggregate with at least 50 percent by weight of the particles retained on the No. 4 sieve having at least one fractured face as tested by ATM 305.
 4. Meet the following gradation:

Sieve	Passing
4 in.	95-100%
2 in.	85-100%
No. 4	30-60%
No. 200	0-6%
- E. Base Course, Grading D-1:
1. Follows DOT&PF specification for Aggregate Base Course, Grading D-1.

2. Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious materials.
 3. Meet the following properties
 - a. L.A. Wear: 50%, max as tested per AASHTO T 96.
 - b. Degradation Value 45 min. as tested by ATM 313
 - c. Fracture: 70%, min as tested per ATM 305
 - d. Plastic Limit: 6, max. as tested per ATM 205
 - e. Sodium Sulfate Loss: 9, max. on 5 cycles per AASHTO T 104
 4. Meet the following gradation:

Sieve	Passing
1 in.	100%
3/4 in.	70-100%
3/8 in.	50-80%
No. 4	35-65%
No. 8	20-50%
No. 50	6-30%
No. 200	0-6%
- F. Base Course, Type II:
1. Follows KPB specification for Type II Material.
 2. Hard, durable particles or fragments of stone or gravel. Do not use materials that break up when alternately frozen and thawed or wetted and dried. Do not include muck, frozen material, roots, sod, or other deleterious matter.
 3. Crushed aggregate with at least 50 percent by weight of the particles retained on the No. 4 sieve having at least one fractured face as tested by ATM 305.
 4. Meet the following gradation:

Sieve	Passing
2 in.	100%
No. 4	30-65%
No. 200	6-10%
- G. Topsoil - Fill Type 6: Topsoil excavated on-site.

2.02 ACCESSORIES

- A. Geotextile Fabric: Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec^{-1} , and meet Class 1 Strength Property Requirements.

2.03 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 31 22 00 for additional requirements.
- D. Verify areas to be filled are not compromised with surface or ground water.

3.02 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.

- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Place bedding and backfill in uniform layers not more than 6 inches deep and compact to meet Item F. Ponding or jetting is not permitted.
- E. Maintain optimum moisture content of fill materials as determined by ATM 207 or ATM 212..
- F. Adjust the moisture content of the fill material to within 2 percent of the optimum moisture content and compact each layer to not less than 95 percent of the maximum density.
- G. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.03 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Soil Fill Materials:
 - 1. The maximum density and optimum moisture will be determined using ATM 207 or ATM 212.
 - 2. Acceptance densities will be determined by ATM 213 and ATM 214.
 - 3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
 - 4. Frequency of Tests: 1 compaction test per 100 lineal feet of pipe.

3.05 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 23

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hot Mix Asphalt (HMA) pavement.
- B. Tack Coat
- C. Repair Traffic Markings

1.02 RELATED REQUIREMENTS

- A. Section 31 23 23 - Fill: Compacted subgrade for paving.

1.03 DEFINITIONS

- A. Qualified Products List (QPL): A list of products that the Department of Transportation & Public Facilities (DOT&PF) has found conforms to the SSHC. The QPL can be accessed online:
http://dot.alaska.gov/stwddes/desmaterials/qpl_intro.shtml

1.04 REFERENCE STANDARDS

- A. DOT&PF Standard Specifications for Highway Construction (SSHC)
- B. AASHTO M 29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
- C. AASHTO M 320 - Standard Specification for Performance-Graded Asphalt Binder

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Job Mix Design:
 - 1. Provide a Job Mix Design (JMD) meeting the requirements of the SSHC, tested and stamped by a Professional Engineer registered in the State of Alaska. The Professional Engineer shall certify that the JMD was performed according to the specified procedures and meets all project specifications.
- C. Product data: Submit manufacturer's data to demonstrate the products used meet the requirements.
- D. Qualified Products List: QPL listings, when applicable, are acceptable submittals in lieu of Product data sheets.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Application Temperatures: Store, mix, and apply asphalt materials within the temperature ranges specified in SSHC Table

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with SSHC.
- B. Mixing Plant: Complying with the SSHC.
- C. Obtain materials from same source throughout.

1.07 FIELD CONDITIONS

- A. Place HMA on a stable/non-yielding roadbed. Do not place HMA when the base material is wet or frozen, or when weather conditions prevent proper handling or finishing of the mix. Do not place HMA leveling course when the roadway surface temperature is colder than 40°.

PART 2 PRODUCTS

2.01 MATERIALS

- A. HMA: Type II, Class B, as defined in the SSHC.
- B. Asphalt Binder: Meet AASHTO M 320 for grade PG 52-28. See SSHC 702-2.01 for additional requirements.

- C. Refer to the SSHC for the following material requirements:
 - 1. Liquid Anti-Strip Additive: See SSHC 401-2.02
 - 2. Joint Adhesive: See SSHC 702-2.05
 - 3. Joint Sealant: See SSHC 702-2.06
 - 4. Warm Mix Asphalt: See SSHC 702-2.07
 - 5. Asphalt Release Agent: See SSHC 702-2.08
 - 6. Aggregates: See SSHC 703-2.04. Use a minimum of three stockpiles of crushed aggregate (coarse, intermediate, and fine). Place blend material, if any, in a fourth pile.
 - 7. Recycled Asphalt Pavement (RAP): RAP may be used in accordance SSHC section 401 and 703-2.16
- D. Tack Coat: Special Tack Emulsion, STE-1. See SSHC 702-2.03 for requirements.
- E. Traffic Paint: See SSHC 708-2.03
- F. Glass Beads: See SSHC 712-2.08

2.02 JOB MIX DESIGN

- A. Provide target values for gradation that satisfy both the Broad Band Gradation limits and the HMA Marshal Design Requirements, specified in the SSHC.
- B. The approved JMD will specify the target values for gradation, the target value for asphalt binder content, the Maximum Specific Gravity of the HMA, the additives, and the recommended mixing temperature range.

PART 3 EXECUTION

3.01 EQUIPMENT

- A. Use equipment in good working order and free of HMA building.
- B. Asphalt Mixing Plant: HMA shall be produced in a plant meeting AASHTO M 156 standards and SSHC 401-3.05 requirements.
- C. Hauling Equipment: Haul HMA in trucks with tight, clean smooth metal beds. Keep beds free of petroleum oils, solvents, or other materials that would adversely affect the mixture. Apply a thin coat of approved asphalt release agent to beds as necessary to prevent mixture adherence. Provide trucks with covers attached and available for use.
- D. Asphalt Pavers: Use self-propelled asphalt pavers with heated vibratory screed assemblies to spread and finish HMA smoothly across the trench cut to the specified thickness without introducing thermal or material segregation.
- E. Rollers: Use rollers designed to compact HMA and capable of reversing without shoving or tearing the mixture. Select rollers that will not crush the aggregate or displace the HMA. Equip vibratory rollers with separate vibration and propulsion controls.

3.02 PREPARATION OF EXISTING SURFACE.

- A. Ensure the base course on which the HMA will be placed is firm and dry.
- B. Clean existing surfaces of loose material and uniformly coat the contact surfaces with approved Tack Coat. Apply Tack Coat in accordance with manufacturer's instructions.

3.03 PLACING ASPHALT PAVEMENT

- A. Use asphalt pavers to distribute HMA.
- B. Place asphalt within 24 hours of applying tack coat.
- C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- E. The lower limit for density is 92.0 percent of the Maximum Specific Gravity as determined by the approved JMD.

3.04 REPAIRING TRAFFIC MARKINGS

- A. Replace the double-yellow centerline and white edge line markings in their pre-construction locations.
- B. Apply paint only to pavements that are clean, dry, and warmer than 40°F.
- C. Remove all dirt, oil, grease, and other foreign matter from the surfaces to be painted.
- D. Apply the paint at the rate of 80 ft²/gal (approximately 20 mils wet film thickness). This rate is effectively 22 gallons of paint per mile of solid 4-inch stripe.
- E. Apply glass beads over the wet painted striping in a uniform pattern at the rate of 6 pounds (± 0.1 pound) of beads per gallon of paint. Pressure-apply the beads using a mechanical dispenser mounted not more than 12 inches behind the paint dispenser.
- F. Apply markings with clear-cut edges, true and smooth alignment, and uniform thickness.

3.05 TOLERANCES

- A. Water must drain across the HMA patch without ponding. The surface must have a uniform texture, without ridges, puddles, humps, depressions, or roller marks. The surface must not exhibit raveling, cracking, tearing, asphalt bleeding, or aggregate segregation. Leave no foreign material, uncoated aggregate or oversize aggregate on the HMA surface.
- B. Maximum vertical variation: 3/16" across the width of the patch, or along a 10-ft straightedge.
- C. Up to 10 percent tolerance is allowed for paint film thickness or yield.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION 32 12 16

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Hydroseeding, mulching and fertilizer.
- D. Maintenance.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Topsoil material.
- B. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- C. Section 31 23 23 - Fill: Topsoil material.

1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Certificate: Certify seed mixture approval by authority having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.02 SEED MIXTURE

- A. Seed Mixture:
 - 1. Slender Wheatgrass (Wainwright): 50 percent.
 - 2. Red Fescue (Arctared): 40 percent.
 - 3. Annual Ryegrass (Lolium): 10 percent.
- B. Upon the Engineer's approval, Nortran Tufted Hairgrass may be used as a substitute for Slender Wheatgrass (Wainwright) if Slender Wheatgrass (Wainwright) is commercially unavailable. If this substitution is made, apply at the same application rate.

2.03 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.04 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: 20-20-10; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 31 22 00.
- B. Place topsoil in accordance with Section 31 22 00.
- C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

- A. Apply seed at a rate of 2.0 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 HYDROSEEDING

- A. Apply seeded slurry with a hydraulic seeder at a rate of 2.0 lbs per 1000 sq ft evenly in two intersecting directions.
- B. Do not hydroseed area in excess of that which can be mulched on same day.
- C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.06 MAINTENANCE

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

- B. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.
- C. Provide maintenance of seeded areas for three months from Date of Substantial Completion.
- D. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- E. Neatly trim edges and hand clip where necessary.
- F. Immediately remove clippings after mowing and trimming.
- G. Water to prevent grass and soil from drying out.
- H. Roll surface to remove minor depressions or irregularities.
- I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- J. Immediately reseed areas that show bare spots.
- K. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 92 19

SECTION 33 01 10.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 14 16.
- B. Disinfection of building domestic water piping specified in Section 22 10 05.
- C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping: Disinfection of building domestic water piping system.
- B. Section 33 14 16 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2018.
- B. AWWA B301 - Liquid Chlorine; 2010.
- C. AWWA B302 - Ammonium Sulfate; 2016.
- D. AWWA B303 - Sodium Chlorite; 2018.
- E. AWWA C651 - Disinfecting Water Mains; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Certificate: From authority having jurisdiction indicating approval of water system.
- D. Disinfection report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- E. Bacteriological report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water complies, or fails to comply, with bacterial standards of Alaska DEC.
- F. Disinfection, Flushing, and Testing Plan. See 33 14 16.

1.05 QUALITY ASSURANCE

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of Alaska.
- C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Test samples in accordance with AWWA C651.

END OF SECTION 33 01 10.58

SECTION 33 14 16
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water distribution piping.
- B. Isolation valves.
- C. Fire hydrants.
- D. Pressure Reducing Valves (PRV).
- E. PRV vault.
- F. Residential water service connections.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Trenching.
- B. Section 31 23 23 - Fill: Bedding and backfilling.
- C. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

- A. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2015.
- B. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- C. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fitting Materials
- D. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems using Hydrostatic Pressure.
- E. ASTM F2620 - Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings.
- F. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2009.
- G. AWWA C504 - Rubber-Seated Butterfly Valves; 2015.
- H. AWWA C800 - Underground Service Line Valves and Fittings; 2014.
- I. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2017.
- J. AWWA C906 - Polyethylene Pipe and Fittings, 4 in through 63 in for Water Distribution.
- K. ANSI/NSF 61 - Drinking Water System Components - Health Effects
- L. ANSI/NSF 372 - Drinking Water System Components - Lead Content

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

- E. HDPE Fusion Qualifications:
 - 1. Submit the qualifications (training, certifications, and experience) of the operator that will oversee the fusion of the HDPE pipe and fittings.
 - 2. Submit manufacturer's brochure for the equipment that will be used to fuse the HDPE pipe and fittings.
- F. Joint data log: Computer printouts, electronic data, and project station for each field fused joint. Include the pressure and temperature applied at each fused joint, along with the date and time the joint was fused. Submit logs to engineer on a weekly basis.
- G. Disinfection, Flushing, and Testing Plan:
 - 1. Provide a schedule and procedure for disinfecting, testing, and flushing all newly installed pipe.
 - 2. Include flush water and de/chlorinated water handling and discharge procedures. Indicate where the water will be discharge.
 - 3. Contractor shall obtain all required permits for discharging flush water. Indicate in the plan which permits are required and which have been obtained. For permits not yet obtained, indicate when they are anticipated for issue.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

1.09 QUALIFICATIONS

- A. The individual who performs the joint fusion is to have written certification from an HDPE pipe manufacturer or supplier stating he/she has successfully completed an 8-hour (minimum) certification class on joint fusion techniques and procedures. In addition, this individual is to have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger.

PART 2 PRODUCTS

2.01 HEALTH EFFECTS REQUIREMENTS

- A. Applies to all materials in contact with water.
- B. Materials shall be certified by an ANSI accredited organization to meet all the requirements of ANSI/NSF 61.

2.02 LEAD FREE REQUIREMENTS

- A. Applies to all materials in contact with water
- B. Materials shall be certified by an ANSI accredited organization to meet ANSI/NSF 61 Annex G, or ANSI/NSF 372.
- C. Only lead-free pipe, flux, and solder will be used, as required by 18 AAC 80.500.
- D. Not more than 0.2 % lead when used with respect to solder and flux; not more than a weighted average of 0.25% lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures

2.03 WATER MAIN PIPING

- A. Polyethylene Pipe: ASTM D3350, for 200 psi pressure rating:
 - 1. Use PE4710 polyethylene resin meeting ASTM D3350 cell classification 445574.
 - 2. Polyethylene resin shall contain color and UV stabilizers meeting or exceeding the requirements of Code C per ASTM D3350.
 - 3. Fittings and adapters: AWWA C906, 200 psi pressure rating.
 - 4. Joints: Butt fused.

5. Adapters: Flange and mechanical joint adapters may be used where shown on the plans. Adapters shall be of the same material and pressure rates as the water main piping.
6. Gaskets: Where flange or mechanical joint adapters are called out on the plans, use rubber gaskets conforming to AWWA C111.
7. Nuts and bolts for fittings: Carbon steel or stainless steel conforming to the dimensional and materials standards as outlined in AWWA C111 and C115. Stainless steel nuts and bolts shall conform to material standards in ASTM F593 and F594 with a minimum tensile strength of 75,000 psi. Nuts and bolts must have imprinted markings indicating the material and grade of the metal used in fabrication.

2.04 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Gate Valves Up To 3 Inches:
 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
- C. Gate Valves 3 Inches and Over:
 1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.
- D. Ball Valves Up To 2 Inches:
 1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.
- E. Swing Check Valves From 2 Inches to 24 Inches:
 1. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.
- F. Butterfly Valves From 2 Inches to 24 Inches:
 1. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

2.05 HYDRANTS

- A. Hydrants: Type as required by utility company.
- B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.
- C. Hose and Pumper Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.
- D. Pressure Rating: According to utility company.
- E. Finish: Primer and two coats of enamel in color required by utility company.

2.06 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 23 23.
- B. Cover: As specified in Section 31 23 23.

2.07 ACCESSORIES

- A. Detectable Warning Tape: Warning tape must not be less than five (5) mil, foil backed, six inches (6") wide vinyl tape, colored blue, with "Caution Buried Water Line Below" continuously printed in black along the tape length.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

- A. Maintain ten (10) feet of separation of water main from sewer piping in accordance with Alaska DEC requirements.
- B. Group piping with other site piping work whenever practical.
- C. Establish elevations of buried piping to ensure not less than 8 feet of cover.
- D. Install pipe to indicated elevation to within tolerance of 5/8 inches.
- E. All HDPE water main piping and fittings are to be butt-fused in accordance with ASTM F2620.
- F. The individual who performs the joint fusion is to have written certification from an HDPE pipe manufacturer or supplier stating he/she has successfully completed an 8-hour (minimum) certification class on joint fusion techniques and procedures. In addition, this individual is to have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger.
- G. Ensure that each joint is fused at the temperature and pressure recommended by the pipe manufacturer in order to achieve the maximum pressure rating for that joint.
- H. All fused joints for HDPE piping and fabricated fittings are to be documented by a computer data logger that records pressure and temperature applied at each fused joint, along with the date and time the joint was fused.
- I. The use of electro-fusion couplings to join HDPE piping is not allowed on the water main. Electro-fusion couplings may be used on water service connections, when approved by the Engineer. The person performing the electro-fusion coupling shall be trained and certified to do electro-fusion.
- J. Install access fittings to permit disinfection of water system performed under Section 33 01 10.58.

3.05 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
- D. Set hydrants to grade, with nozzles at least 20 inches above ground.
- E. Locate control valve 4 inches away from hydrant.
- F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

3.06 SERVICE CONNECTIONS

- A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with bypass valves and sand strainer.

3.07 FLUSHING AND TESTING

- A. Flushing and testing is to be completed as specified in the requirements of the referenced AWWA standards unless hereinafter modified. The Engineer or representative must be present for all flushing and testing.

- B. Flushing and testing is to be completed separately and sequentially starting with pre-disinfecting, flushing, hydrostatic testing, disinfection, and continuity. The Contractor is to provide, install and remove fittings, pipes, pumps, hoses, gauges and other items necessary to perform the flushing and testing.
- C. All water piping must be flushed and tested before the piping system can be put into service.
- D. Pipe, gaskets, mechanical joints, fittings, valves, hydrants and other components found to be cracked or defective through flushing and testing are to be removed and replaced with sound material at the Contractor's expense. When repairs are needed to make corrections pass flushing and testing requirements, the flushing and testing procedures are to be restarted for all test sections impacted by the repair.
- E. Earthwork for roadways shall be Substantially Complete prior to flushing and testing.
- F. Pre-disinfecting:
 - 1. The Contractor is to place calcium hypochlorite granules/tablets in the water main as it is being constructed. For 8-inch pipe, place a minimum of 6.7 oz of granules/tablets at the fill point and at an interval of 500'.
 - 2. At the completion of the water pipe installation, but prior to flushing the Contractor is to slowly fill the newly installed pipe, fire hydrants, services, and other appurtenances with water, limiting flow velocity to less than one foot per second (1 ft/sec).
 - 3. Upon filling the pipe, the Contractor is to wait one hour prior to flushing.
- G. Flushing:
 - 1. All newly installed water pipes are to be open-bore flushed through un-restricted outlets. Flush water is to achieve a minimum velocity of three feet per second (3 ft/sec) and the minimum water quantity flushed at the minimum velocity is to equal three times the quantity of water in the piping being flushed.
 - 2. The Contractor is to configure the flushing operation, where possible, from higher to lower elevation, utilizing higher pressure mains first.
- H. Hydrostatic Testing:
 - 1. All hydrostatic testing will be performed through a test copper. The test station is to be placed at the highest end of the pipe being tested when there is an elevation change in the pipe greater than ten feet (10 ft).
 - 2. The test pressure is not to exceed the maximum allowable operating pressure of the pipe, fittings, valves, thrust restraints, or other appurtenances of the test section.
 - 3. Use of fire hydrants for testing will not be allowed.
 - 4. The specified test pressure shall be applied by means of an approved pumping assembly connected to the pipe in a manner satisfactory to the Engineer.
 - 5. When the pressure decreases below the required test pressure during the test period, the pipe being tested will be declared void and will require re-testing.
 - 6. The Contractor shall suitably valve-off or plug the outlet to the existing or previously-tested water main at his expense prior to making the required hydrostatic test.
 - 7. Prior to testing, all air is to be expelled from the pipe.
 - 8. If permanent air vents are not located at all high points and dead ends, the Contractor must install and abandon corporation stops at such points so the air can be expelled as the line is slowly filled with water.
 - 9. All intermediate valves within the section being tested will be closed and reopened during the test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.
 - 10. Hydrostatic testing of water lines containing a chlorine mixture above 2 ppm will not be allowed.
 - 11. Newly installed HDPE water main is to be hydrostatically tested to two hundred pounds per square inch (200 psi) in two phases.
 - a. Phase 1 - Initial Expansion (4 hours). Pressurize the test section to the test pressure and maintain for four (4) hours. The contractor is to pump in additional test water into

the pipe to maintain test pressure as the pipe expands slightly. It is not necessary to monitor the amount of water added during this phase.

- b. Phase 2 - Pressure Testing (minimum 1 hour). Immediately following the initial expansion phase, the Contractor is to stop adding testing fluid and then reduce the pressure by 10 psi. The reduced pressure then becomes the test pressure and is to be held within five percent (5%) for one hour and show no visible leaks to be deemed as having passed the test.
- c. The maximum test duration is eight (8) hours. If the test is not completed in the maximum duration period, then the Contractor is to depressurize the test section completely and allow it to relax for at least eight (8) hours before pressurizing the test section again.

END OF SECTION 33 14 16

SECTION 33 31 13
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- K. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).
- M. OWSIM - Alaska Department of Environmental Conservation Onsite Wastewater System Installation Manual, latest edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Field Quality Control Submittals: Document results of field quality control testing.
- F. Project Record Documents:
 - 1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 PRECEDENCE OF REQUIREMENTS

- A. If there are conflicts between these specifications and the OWSIM, the OWSIM has precedence.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. Plastic Pipe: ASTM D2680 Acrylonitrile-Butadiene-Styrene (ABS) material, schedule 40; inside nominal diameter as shown on plans, bell and spigot style solvent sealed joint end.
- C. Fittings: Mechanical watertight couplings, such as Fernco couplings, or approved equal. Banded rubber couplings are only allowed for connecting the Building Sewer, the Disposal Sewer and the cleanout pipes to the septic tank. Do not use banded rubber couplings for any other purpose.
- D. Pipe Joints: Clean prior to gluing and glue with proper cement for the pipe type.

2.03 BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Section 31 23 23.
- B. Pipe Cover Material: As specified in Section 31 23 23.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

- A. See Section 31 23 16 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Clay Pipe: Also comply with ASTM C12.
 - 2. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.05 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 13

SECTION 33 34 13
SEPTIC TANKS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building sewer, septic tank, distribution box, disposal sewer, cleanouts, and absorption field system.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Soil cover over tank and drainage field.
- B. Section 31 23 16 - Excavation: General requirements for trenching for drainage field and connecting piping.
- C. Section 31 23 23 - Fill: General requirements for backfilling piping trenches including compaction testing.
- D. Section 31 23 23 - Fill: Soil cover over tank and drainage field.

1.03 REFERENCE STANDARDS

- A. State of Alaska - Onsite Wastewater System Installation Manual, Alaska DEC, 2016
- B. IPC - International Plumbing Code
- C. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).
- D. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.
- E. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- F. AASHTO M 288 - Standard Specification for Geotextile Specification for Highway Applications.
- G. OWSIM - Alaska Department of Environmental Conservation Onsite Wastewater System Installation Manual, latest edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate plan, location and inverts of filter field, inverts of connecting piping.
- C. Product Data: Provide data on tank accessories.
- D. Manufacturer's Installation Instructions: Indicate special procedures for septic tank installation.
- E. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components, and connections.
- F. Name and Certified Installer (CI) number of the person that will oversee installation.
- G. Percolation Test documentation.

1.05 QUALITY ASSURANCE

- A. Comply with applicable code and regulations for work of this section.
- B. Septic systems shall be installed by a Certified Installer.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of systems.

1.06 INSTALLER QUALIFICATIONS

- A. The sewer piping, infiltration chambers, and septic tanks shall be installed by, or under the direct supervision of, a DEC Certified Installer.

1.07 PRECEDENCE OF REQUIREMENTS

- A. If there are conflicts between these specifications and the OWSIM, the OWSIM has precedence.

PART 2 PRODUCTS

2.01 SEPTIC TANK AND DISTRIBUTION BOX

- A. Septic Tank: Steel with protective epoxy coating, partitioned chambers, lid with lift rings, vent, inlet inspection hole, inlet turned down minimum 12 inches below effluent level.
- B. Tank Capacity: 1,250 gallon.
- C. Distribution Box: Reinforced concrete, single inlet, two outlets, gate, removable cover with lift ring.

2.02 CONNECTING PIPE MATERIALS

- A. Plastic Pipe (ABS) : ASTM D2680, nominal inside diameter as shown on plans, bell and spigot solvent sealed joints.
- E. Plastic Pipe (PVC): ASTM D3034 Type PSM; nominal inside diameter as shown on plans, bell and spigot solvent sealed joints.
- F. Fittings: Same material as pipe, tee bends, elbows, cleanouts, reducers, ends to suit pipe joint.

2.03 INFILTRATION CHAMBER MATERIALS

- A. Each chamber shall have a storage capacity of at least 43 gal.
- B. Chambers shall be certified by the International Association of Plumbing and Mechanical Officials (IAPMO).
- C. Supports a wheel load of 16,000 lbs./axle with 12" of cover.
- D. Infiltrator Quick4 Standard or approved equal.

2.04 BEDDING AND BACKFILL MATERIALS

- A. Provide bedding and backfill materials as specified in Section 31 23 23 and as follows:
- B. Tank Bedding Material: Granular fill, as recommended by manufacturer.
- C. Tank Backfill Material: Granular fill.
- D. Connecting Piping Bedding Material: Granular fill.
- E. Connecting Piping Backfill Material: Granular fill.
- F. Filter Drain Bedding Material: Granular fill.
- G. Filter Drain Cover Material: Granular fill.
- H. Geotextile Fabric: Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec^{-1} , and meet Class 3 Strength Property Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building sanitary sewer connection, size, location and invert are as indicated.

3.02 PREPARATION

- A. Ream pipe ends and remove burrs.
- B. Remove scale and dirt from components before assembly.
- C. Establish invert elevations for all components in the system.
- D. Avoid driving equipment or other activities that will compact the native soils in the location of the absorption field.

3.03 EXCAVATING AND TRENCHING

- A. See Section 31 23 16 and Section 31 23 23 for general requirements.

3.04 TANK INSTALLATION

- A. Hand trim excavation for accurate placement of tank to elevations indicated.
- B. Place bedding material level in one continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
- C. Install septic tank and distribution box and related components on bedding in accordance with manufacturer's instructions.
- D. Backfill around sides of tank, tamped in place and compacted to 95 percent.

3.05 CONNECTING PIPING INSTALLATION

- A. Connect outlet between building sanitary piping and septic tank, between septic tank and distribution box, between distribution box and filter field header.
- B. Place pipe and fittings on clean excavated subsoil.
- C. Slope piping to each successive component, minimum of 1/4 inch per foot.
- D. Cover pipe with backfill, sides and top. Place geotextile fabric over cover prior to backfilling.

3.06 INSTALLATION - ABSORPTION FIELD

- A. Install infiltration chambers per manufacturer's instructions.
- B. Place geotextile fabric on top of native subsoil, before installing infiltration chambers.

3.07 PERCOLATION TESTS

- A. Contractor shall have an engineer registered in the State of Alaska perform a percolation test.
- B. Provide Engineer 48 hours' notice before the test hole is scheduled.
- C. Test hole and percolation test shall be completed at least one week before beginning installation of a septic system.

3.08 PROTECTION

- A. Do not permit vehicular traffic over drainage field.

END OF SECTION 33 34 13