

**SECTION 00920
APPLICATION AND CERTIFICATE FOR PAYMENT**

PROJECT NAME: _____ CONTRACTOR: _____ PAYMENT ESTIMATE #: _____
 _____ PERIOD _____ THRU _____
 _____ CONTRACT DATE: _____

ENGINEER: Clear Water Solutions, Inc.
 ENGINEER'S PROJECT NUMBER: _____
 A. ORIGINAL CONTRACT AMOUNT: \$ _____
 B. APPROVED CHANGE ORDERS: \$ _____
 C. TOTAL CONTRACT AMOUNT TO DATE: \$ _____

1. CONTRACT WORK TO DATE: \$ _____
 2. CHANGE ORDER WORK TO DATE: \$ _____
 3. MATERIALS STORED TO DATE: \$ _____
 4. TOTAL COMPLETED AND STORED TO DATE: \$ _____
 (line 1+2+3)
 5. RETAINAGE ____%: \$ _____
 6. TOTAL EARNED TO DATE LESS RETAINAGE: \$ _____
 (line 4 less line 5)
 7. PREVIOUS CERTIFICATES FOR PAYMENT: \$ _____
 8. CURRENT PAYMENT DUE: \$ _____
 (line 6 less line 7)
 9. BALANCE TO FINISH, PLUS RETAINAGE \$ _____
 (line C less line 6)

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: _____ State of: _____ County of: _____
 SEAL _____ day of _____ 20____

BY: _____ DATE: _____ Notary Public: _____

ENGINEER'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the date comprising the above Application, the Engineer certifies to the Owner that to the best of the Engineer's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$ _____

(Attach explanation if amount certified differs from the amount applied for)

ENGINEER: Clear Water Solutions, Inc.

BY: _____ DATE: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work covered by contract documents
- B. Work by Owner
- C. Work by others
- D. Contractor use of site and premises
- E. Work sequence
- F. Owner occupancy
- G. Easements and right-of-way
- H. Fences
- I. Protection of public and private property
- J. Maintenance of traffic
- K. Field Engineering
- L. Lines and grades
- M. Regulatory requirements
- N. Cutting and patching
- O. Alteration Project Procedures
- P. Coordination

1.2 WORK COVERED BY CONTRACT DOCUMENTS

The Work of this Contract consists of providing an interconnecting pipeline between the Little Thompson Water District (LTWD) and the City of Loveland. Under normal operating conditions, water will be delivered from the LTWD's system and its higher hydraulic gradeline to the City of Loveland's "southwest tank". However, provisions include the capability to pump water from the City of Loveland's system to the LTWD system. Flow rates shall be established

between the two entities and must be quantifiable via the bi-directional magmeter. The City shall supply the precast vault, magmeter and Cla-Val control valve (vault to be stored at precaster and other components to be stored at City Service Center). Contractor shall be responsible for shipping and transportation of all components to job site. Contractor shall be responsible for supply and installation of all other equipment. The City shall complete SCADA programming. Contractor shall be responsible for providing LTWD with 110 power and readout of flow from City system. LTWD shall install a SCADA system to meet their needs following completion of this project.

- A. Furnish all materials, equipment, supplies, and appurtenances; provide all construction plant equipment and tools; and perform all necessary labor and supervision.
- B. Coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities and Owner to insure the progress of Work.
- C. It is the intent of this contract that Work proceed in the most expeditious manner possible.
- D. Construct the Work under a lump sum price contract as indicated in the Bid Form.

1.3 WORK BY OWNER

- A. The City of Loveland must operate their water utility continuously throughout the duration of the project. Construction shall not disrupt existing activities. **A 4 hour window has been allotted for final tie-in of the proposed improvements at the existing City of Loveland tank vault.**

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Coordinate use of premises under direction of Owner.
- B. Assume full responsibility for the protection and safekeeping of products stored on site under this Contract.
- C. Move any stored products, under Contractor's control, which interfere with operations of the Owner.
- D. Obtain and pay for the use of additional storage or work areas needed for operations.

1.5 WORK SEQUENCE

- A. Construct Work in stages to allow for Owner's continuous occupancy and for uninterrupted service of water utility. Coordinate construction schedule and operations with the Owner.
- B. Sequences other than those specified will be considered by Engineer, provided they afford equivalent continuity of operations.

1.6 EASEMENTS AND RIGHT-OF-WAY

- A. Confine construction operations to the immediate vicinity of the location indicated on drawings and use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property and interference with traffic.

1.7 FENCES

- A. Contractor is allowed to remove fence as required to complete Work with the following exceptions:
 - 1. Fence shall contain no visible splices upon completion of work
 - 2. Fence must be repaired by end of work day.
- B. Keep gates closed and locked when not in use and at the completion of each day's Work.

1.8 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by construction operations.
- B. Restore to their original condition, pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences and other surface structures affected by construction operations together with sod and shrubs in yards and parkings, whether within or outside the easement.
- C. Use new materials for replacements.
- D. Do not remove trees outside the permanent easement, except as authorized by Owner
 - 1. Where practical, tunnel beneath trees in yards and parkings when on or near the line of trench.
 - 2. Employ hand excavation as necessary to prevent tree injury.
 - 3. Adequately protect trees left standing against damage by construction operations.
- E. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any or site thereof, whether by him or his subcontractors.
- F. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

1.9 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of Colorado and acceptable to the Engineer.
- B. Contractor to locate and protect survey control and reference points.
- C. Control datum for survey is that established by Owner provided survey and shown on Drawings.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.10 LINES AND GRADES

- A. Construct all Work to the lines, grades, and elevations indicated on the drawings.
 - 1. Remove and reconstruct improperly located Work.
- B. Engineer will establish or designate 2 basic horizontal and vertical control points.
 - 1. Use these points as datum for the Work.
 - 2. Provide, without charge, such competent personnel and tool, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking layout survey, and measurement work performed by Contractor.
- C. Provide all additional survey, layout, and measurement work required.
 - 1. Work performed by a qualified professional engineer or registered land surveyor acceptable to Engineer.
 - 2. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - a. Make no changes or relocations without prior written notice to Engineer.
 - b. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - c. Require surveyor to replace Project control points which may be lost or destroyed.
 - 1) Establish replacements based on original survey control.
 - 3. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate mean.
 - a. Site improvements
 - 1) Stakes for grading, fill and topsoil placement
 - 2) Utility slopes and invert elevations
 - b. Batter boards for structures
 - c. Controlling lines and levels required for the mechanical and electrical trades
 - 4. From time to time, verify layouts by the same methods.
 - 5. Maintain a complete, accurate log of all control and survey work as it progresses.
 - 6. On request of Engineer, submit documentation to verify accuracy or field engineering work.

1.11 REGULATORY REQUIREMENTS

- A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work.
- B. References in the Contract Document to local codes shall mean the codes in effect in the City of Loveland and Weld County.
- C. Other standards and codes which apply to the Work are designated in the specifications.

1.12 COORDINATION

- A. Coordinate scheduling, submissions, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of vault. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. 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.
- E. Coordinate with LTWD to ensure tapping materials and procedures are acceptable prior to construction. Submit one extra copy of tapping related submittals for LTWD evaluation.
- F. Coordinate with LTWD at least 48 hours in advance of installation of hot tap and bypass vault piping. Ensure LTWD observes installation of this work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Format and Data Required
- B. Preparation of Application for each Progress Payment
- C. Substantiating Data for Progress Payments
- D. Preparation of Application for Final Payment
- E. Submittal Procedure
- F. Basis of Payment

1.2 RELATED SECTIONS

- A. Agreement
- B. General Conditions: Progress Payments, Retainage, and Final Payment
- C. Supplementary Conditions

1.3 FORMAT AND DATA REQUIRED

- A. Submit applications typed on Application for Payment and Certificate for Payment using AIA Document G702/G703, or a similar form, as included in Section 00920 with itemized data typed on 8 1/2" by 11" white paper continuation sheets. Copies of forms are available from Engineer.

1.4 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Submit Applications for Payment to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.
- B. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to the date of submittal application.
 - 2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.
 - 3. Execute certification with the signature of authorized officer of the Contractor's firm.

4. Notarize signature where required on Certificate for Payment.

C. Continuation Sheets:

1. Fill in total list of all scheduled component items of Work, with time number and the scheduled dollar value for each item.
2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored.
3. List each Change Order executed prior to the date of submission at the end of the continuation sheets:
 - a. List by Change Order number, dollar amount and description as for an original component item of work.
4. 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.

1.5 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When Owner or Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:

1. Project
2. Application number and date
3. Detailed list of enclosures
4. For stored products:
 - a. Item number and identification as shown on application
 - b. Description of specific material

B. Submit 1 copy of data and cover letter for each copy of application.

C. Submit an updated construction schedule with each application for payment.

D. Submit evidence of payment and release of liens within 60 days of payment to Contractor for Work performed by subcontractors or for equipment and materials delivered to the site during construction.

1.6 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Use continuation sheets for presenting the final statement of accounting as specified in Section 01700—Contract Closeout.

1.7 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.

B. Number: Five copies of each Application

- C. When Engineer finds the Application properly completed and correct, he will transmit two Certificates for Payment to Owner, with a copy to Contractor. Upon approval by Owner, Owner will transmit payment to Contractor with one copy of Certificate attached.

1.8 BASE BID

- A. No quantity measurement for payment will be made
- B. Payment will be made on a lump sum basis relative to percent complete based upon Owners agreed upon schedule of values
- C. Lump Sum price includes all work defined within the contract documents for a complete and functional system.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements
- B. Preconstruction conference
- C. Progress meetings

1.2 RELATED SECTIONS

- A. Section 01010—Summary of Work
- B. Section 01310—Construction Schedules
- C. Section 01340—Shop Drawings and Product Data
- D. Section 01700—Contract Closeout

1.3 GENERAL REQUIREMENTS

- A. Owner will schedule and administer pre-construction meeting, schedule finalization meeting, regularly scheduled progress meetings, and specially called meetings throughout the progress of the Work.
 - 1. Prepare agenda for meetings including items requested by Owner and Contractor.
 - 2. Preside at meetings.
 - 3. Record the minutes; include all significant proceedings and decisions.
 - 4. Reproduce and distribute copies of minutes within 5 days after each meeting.
 - a. To all participants in the meetings
 - b. To Owner
 - c. Furnish 3 copies of minutes to Contractor
- B. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.4 PRECONSTRUCTION CONFERENCE

- A. Owner will schedule preconstruction conference after Notice of Award.
- B. Location: City Service Center
- C. Attendance

1. Owner's Representative
2. Engineer and his professional consultants
3. Resident Project Representative
4. Contractor's Superintendent
5. Major Subcontractors
6. Major Suppliers
7. Others as appropriate

D. 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 and suppliers, list of products, Schedule of Values, and progress schedule
5. Designation of personnel representing the parties in Contract
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures
7. Construction scheduling and updates
8. Scheduling activities of geotechnical Engineer
9. Critical work sequencing
10. Major equipment deliveries and priorities
11. Procedures for maintaining Record Documents
12. Use of premises
 - a. Office, work and storage areas
 - b. Owner's requirements
13. Construction facilities, controls and construction aids
14. Temporary utilities provided by Owner
15. All safety and first-aid procedures are responsibility of the Contractor
16. Security and housekeeping procedures as required by the Owner
17. Procedures for testing
18. Requirements for start-up of equipment

1.5 PROGRESS MEETINGS

- A. Owner will schedule and administer meetings throughout progress of the Work at maximum one-week intervals.
- B. Location of the Meetings: City Service Center or project site as designated by Owner
- C. Owner will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings; record minutes, and distribute copies within two days to Contractor, Owner, participants, and those affected by decisions made.
- D. Attendance
 1. Owner's Representative

2. Engineer, and his professional consultants as needed
3. Resident Project Representative
4. Contractor's Superintendent
5. Subcontractors as appropriate to the agenda
6. Suppliers as appropriate to the agenda
7. Others, as appropriate

E. Agenda:

1. Review minutes of previous meetings
2. Review unresolved issues from last meeting
3. Review of Work progress
4. Field observations, problems, conflicts and decisions
5. Identification of problems which impede planned progress
6. Review of submittals schedule and status of submittals
7. Review of off-site fabrication and delivery schedules
8. Maintenance of progress schedule
9. Corrective measures to regain projected schedules
10. Planned progress during succeeding work period
11. Coordination of projected progress
12. Maintenance of quality and work standards
13. Effect of proposed changes on progress schedule and coordination
14. Other business relating to Work

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01310
CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements
- B. Format
- C. Content
- D. Progress Revisions
- E. Submittals
- F. Distribution

1.2 RELATED SECTION

- A. Section 01010—Summary of Work
- B. Section 01025—Measurement and Payment
- C. Section 01200—Project Meetings
- D. Section 01340—Shop Drawings and Product Data
- E. Section 01700—Contract Closeout

1.3 REQUIREMENTS

- A. Within 10 days after Effective Date of Agreement, Contractor shall prepare and submit to Owner estimated construction progress schedules for the Work, with subschedules of related activities which are essential to its progress
- B. Submit revised progress schedules with each pay request
- C. Owner may require Contractor to add to his plant, equipment, or construction forces, as well as increase the working hours, if operations fall behind schedule at any time during construction period

1.4 FORMAT

- A. General schedule format: Conform to ©Primavera, Suretrack critical path method (CPM) scheduling format or approved equal:
 - 1. Base schedule on work days and regular working hours, Monday through Friday.
 - 2. Minimum sheet size: 8 1/2" by 11"
 - 3. Color format

- B. Row (Listings)—Show:
 - 1. Project Title
 - 2. Major areas of construction
 - 3. Construction activities within major areas of construction
 - 4. Provide a separate bar for each construction activity. Bars to be annotated with activity description
 - 5. Critical path activities to be clearly identified by color and lines
 - 6. List in chronological order by start date each major area of construction and then by each construction activity within its respective area of construction
 - 7. Show project start date, finish date, data date, run date, and revision table
 - 8. Contract milestone dates
 - 9. Legend

- C. Column (Headings)—Show:
 - 1. Activity ID: Define by number corresponding to major specification sections
 - 2. Activity Description
 - 3. Percent Complete
 - 4. Original Duration
 - 5. Remaining Duration
 - 6. Total Float
 - 7. Early Start
 - 8. Early Finish
 - 9. Time Scale: Identify first day of each week. Allow space for notations.
 - 10. Data date line

1.5 CONTENT

- A. Construction progress schedule—Show:
 - 1. Complete sequence of construction by activity for full length of Contract time.
 - 2. Major areas of construction to include, at a minimum, each separate stage of Work.

- B. Submittals schedule for shop drawings and product data—Show:
 - 1. The dates for Contractor's submittals
 - 2. The dates accepted submittals will be required from Engineer. Extensions of time for delays in submittal approval shall only be allowed as provided in Section 01340

1.6 PROGRESS REVISIONS

- A. Progress schedules are to be representative of actual construction progress and sequencing of activities. Schedules that do not accurately represent construction progress will be rejected
- B. Indicate progress of each activity as of data date
- C. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope
 - 2. Activities modified since previous submission
 - 3. Revised projections of progress and completion
 - 4. Other identifiable changes
- D. Provide narrative report as needed to define:
 - 1. Problem areas, anticipated delays, and impact on schedule
 - 2. Corrective action recommended, and its effect
 - 3. Effect on changes on schedules of other prime contractors

1.7 SUBMITTALS

- A. Submit initial schedules within 10 days after award of Contract:
 - 1. Engineer will review schedules and return review copy within 10 days after receipt
 - 2. If required, resubmit within 7 days after return of review copy
- B. Submit revised progress schedules with each Application for Payment
- C. At each submission submit the number of opaque reproductions which the Contractor requires, plus 3 copies which will be distributed by Engineer. Do not submit fewer than 5 copies
- D. Submit 1 reproducible transparency and 1 opaque reproduction initially, 2 opaque reproductions for each resubmission

1.8 DISTRIBUTION

- A. Engineer will distribute copies of accepted schedules to:
 - 1. One copy to Owner
 - 2. One copy to Resident Project Representative
 - 3. One copy to be retained in Engineer's file
 - 4. One copy to Contractor to be kept on file at job site
 - 5. Remainder to Contractor for his distribution
- B. Schedule recipients will report promptly to Engineer and Contractor, in writing, any problems anticipated by projections shown in schedules

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

- A. Section 01310—Construction Schedules
- B. Section 01700—Contract Closeout
- C. Sections for Divisions 1 through 16—Required Submittals

1.3 SUBMITTALS

- A. Shop Drawings—Drawings shall be presented in a clear and thorough manner:
 - 1. Identify details by reference to sheet and detail, schedule or other references as shown on Contract Drawings.
 - 2. Identify equipment by reference to equipment name and tag number shown on Contract Drawings.
 - 3. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices.
 - 4. Minimum sheet size: 8 1/2" by 11"
 - 5. Fabrication drawing size: 11" by 17" or 24" by 36"
- B. Product Data—Preparation:
 - 1. Clearly mark each copy to identify pertinent products or models submitted for review.
 - 2. Identify equipment by reference to equipment name and tag number.
 - 3. Catalog cut sheets: Cross-out or delete irrelevant data
 - 4. Show performance characteristics and capacities.
 - 5. Show dimensions and clearances required for installation and maintenance.
 - 6. Show wiring or piping diagrams and controls.
 - 7. Show external connections, anchorages, and supports required.
- C. "Certificate of Compliance":
 - 1. Provided by manufacturer or supplier in lieu of submittal data required.

2. Certifies that product data or item identified in certificate is in total compliance with Contract Document requirements.
 3. Specifically identifies project name and that there is no deviation from Contract Documents.
 4. Identify equipment by reference to equipment name and tag number.
 5. Identify limits of equipment, materials or work provided.
 6. Provide for specific product data or item only as indicated herein.
- D. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed.

1.4 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission.
- B. Approve and stamp each submission before submitting it.
- C. Determine and verify:
 1. Field measurements
 2. Field construction criteria
 3. Catalog numbers and similar data
 4. Conformance with specifications
- D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted.
- E. Verify that each item and the submittal for it conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto.
- F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor.
- G. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 1. Identify and tabulate all deviations in transmittal letter.
 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation.
 3. Include required piping and wiring diagrams.

1.5 SUBMISSION REQUIREMENTS

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery.
- B. In scheduling, allow a minimum of 14 calendar days for review by Engineer following receipt of submission in Engineer's office:
 - 1. Time required to mail submissions or resubmissions is not considered a of review period.
- C. Consecutively number all submissions:
 - 1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections.
 - 2. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.).
- D. Number of Submittals Required:
 - 1. Shop Drawings and Product Data: Submit a maximum of 2 copies for Contractor's use, plus a maximum of 3 copies which will be distributed by Engineer when approved.
 - 2. Samples: Submit 3 of each office sample unless specified otherwise in individual specification section.
- E. Accompany each submission with a letter of transmittal showing all information required for identification and checking. Submittals shall contain:
 - 1. Submittal number
 - 2. Date of submission and dates of any previous submissions
 - 3. Project title and number
 - 4. Owner Contract identification number if applicable
 - 5. The names of
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 6. Identification of the product, with the specification section number
 - 7. Field dimensions, clearly identified as such
 - 8. Relation to adjacent or critical features of the Work or materials
 - 9. Applicable standards, such as ASTM or Federal Specification numbers
 - 10. Identification of deviations from Contract Documents
 - 11. Identification of revisions on resubmissions
 - 12. An 8" by 4" blank space for Contractor's and Engineer's stamps
 - 13. Stamp cover sheet of each submittal as identified in letter of transmittal
 - 14. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

This submittal has been reviewed by [*name of contractor*] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [*Name of contractor*] also warrants that this submittal complies with contract documents and comprises no deviations thereto:

Section No: _____ Submittal No: _____

Date: _____ by: _____

F. Submittal Log:

1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions.
2. Show submittal number, section number, section title, submittal description dates and disposition of submittal.
3. Make submittal log available to Engineer for Engineer's review upon request.

G. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:

1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received.
2. Submit a complete initial submittal including all components when an item consists of components from several sources.
3. Partial submittals may be rejected as not complying with provisions of the Contract.
4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions.
5. Do not include items from more than one specification section for any one submittal number.

H. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents.

1.6 DISPOSITION OF SHOP DRAWINGS AND PRODUCT DATA

A. "Approved As Submitted": Approved with No Exceptions Noted

1. One copy sent to Owner
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers, or subcontractors
5. No corrections or comments noted on submittal or in transmittal letter

6. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter
 7. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
1. One copy sent to Owner
 2. One copy sent to Resident Project Representative
 3. One copy retained in Engineer's file
 4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers or subcontractors
 - c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections.
 5. Comply with corrections or comments as noted on submittal and in transmittal letter.
 6. Resubmission not required
- C. "Revise And Resubmit": Incorrect or Specific Information Still Required
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor for revision and resubmittal
 4. Copy of transmittal letter sent to Owner. An "Approved As Submitted" or "Exceptions Noted" submittal will be forwarded to Owner upon resubmission and review per above disposition requirements
 5. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in resubmittal; and/or additional information may be required as noted in transmittal letter
 6. Submitted information may not include or address specific item required per the specification as identified in transmittal letter
 7. Specific information related to identified item may be required for final approval of submittal
 8. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified in transmittal letter.
- D. "Rejected": Returned for Correction
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor
 4. Copy of transmittal letter sent to Owner
 5. Contractor required to resubmit complete submittal package in accordance with Contract Documents.
 6. Submittal does not comply with provisions of Contract Documents as noted in transmittal letter.
 7. Resubmission required
- E. "Receipt Acknowledged": For Reference Purposes Only or for Record Copy

1. One copy sent to Resident Project Representative
2. One copy retained in Engineer's file
3. One copy returned to Contractor
4. Copy of transmittal letter sent to Owner
5. Remaining submittal copies destroyed
6. Detailed review and comment by Engineer not required
7. Resubmission not required

1.7 DISPOSITION OF SAMPLES

- A. "Approved As Submitted": Approved with No Exceptions Noted
 1. One sample sent to Owner
 2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgment: Copy of transmittal letter sent to Contractor
 5. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
 1. One sample sent to Owner
 2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgment: Copy of transmittal letter sent to Contractor
 5. Work performed or products furnished to comply with exceptions noted in acknowledgment
 6. Resubmission not required
- C. "Rejected": Returned for Correction
 1. One sample retained in Engineer's file
 2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
 3. Copy of transmittal letter sent to Owner
 4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until approved.
- B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., 1, 1A, 1B, etc.).
- C. Shop Drawings and Product Data:
 1. Revise initial drawings or data and resubmit as specified for the initial submittal.
 2. Indicate any changes which have been made other than those requested by Engineer.

- D. Samples: Submit new samples as required for initial submittal
- E. Reimbursement of Resubmission Review Costs:
 - 1. Review of first submittal [and one resubmittal] will be performed by Engineer at no cost to the Contractor.
 - 2. Costs for review of subsequent resubmissions will be directly paid by Contractor.
 - 3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts.
 - 4. Charges for review of resubmissions will include Engineer at maximum rate of \$100 per hour and Submittal Clerk at maximum rate of \$50 per hour.

1.9 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness and in accord with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above:
 - 1. In the event that Engineer will require more than 14 calendar days to perform an expedited submittal review as requested by Contractor, Engineer shall so notify Contractor or indicate so on the submission schedule.
 - 2. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:
 - a. Contractor has notified Engineer in writing that an expedited review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 14 days of receipt of the submittal or receipt of said notice, whichever is later.
 - c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 14 days.
 - 3. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions.
- B. Review drawings and data submitted only for general conformity with Contract Documents:
 - 1. Engineer's review of drawings and data returned marked "Approved As Submitted" or "Exceptions Noted" does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown.
 - 2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents.
 - 3. Engineer's review shall not extend to means, methods, techniques, sequences, operations of construction, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals.

- C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
 - 1. Consider and review only those deviations from the Contract Documents clearly identified as such in submittal and tabulated in the Letter of Transmittal.
- D. Return submittals to Contractor for distribution or for resubmission.
- E. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors.
- F. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor.
- G. Engineer will not review uncalled-for shop drawings or product data except by special arrangement.
- H. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

↑ Approved As Submitted	↑ Exceptions Noted
↑ Revise And Resubmit	↑ Rejected
<p>This review was performed only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Modifications or comments made on the shop drawings and product data during this review do not relieve contractor from responsibility for compliance with the requirements of the plans and specifications. Approval of a specific item does not include approval of the assembly of which the item is a component. Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; coordination of the work of all trades; and for performing all work in a safe and satisfactory manner.</p> <p style="text-align: center;">Clear Water Solutions, Inc.</p> <p>Date _____ By _____</p>	

1.10 SUBMITTAL SCHEDULE

- A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control
- C. Construction Facilities: Access roads, parking, progress cleaning, project signage, storage and temporary buildings

1.2 GENERAL REQUIREMENTS

- A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems as work progress requires.
- B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work.
- C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work.
- D. Contractor may use existing roadways for access and parking to the extent practical. Provide any additional access and parking required for Contractor's personnel or operations.
- E. Provide storage sheds as required by the Contractor.
- F. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards.
- G. Clean and repair damage caused by temporary installations or use of temporary facilities.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. Comply with applicable Federal and State rules and regulations, local codes and ordinances.
 - 2. Comply with utility company requirements.

1.4 TEMPORARY WATER SERVICE

- A. There is limited existing potable water service at the site.
- B. Provide all water required for construction purposes.
- C. Provide all drinking water required by construction personnel. Pay all costs.

1.5 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities
 - 1. As required by laws and regulations.
 - 2. Not less than 1 facility.
- B. Service, clean and maintain facilities and enclosures.
- C. Do not permit construction personnel to use Owner's facilities.

1.6 WATER CONTROL

- A. Grade site in accordance with site grading plan. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion in accordance with City of Loveland storm drainage criteria.

1.7 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections.

1.8 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program. Owner will work with Contractor to provide site access.

1.9 PARKING

- A. Utilize dirt surface parking areas within site for construction personnel.

1.10 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 remote spaces prior to enclosing the space.
- C. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations.
- D. Broom and vacuum clean interior areas prior to start of surface finishing.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures
- B. Final cleaning
- C. Adjusting
- D. Contractor's closeout submittals
- E. Project record documents
- F. Warranties
- G. Delivery to Owner
- H. Substantial completion
- I. Final inspection
- J. Reinspection fees
- K. Final adjustments of accounts
- L. Final application for payment

1.2 RELATED SECTIONS

- A. Agreement
- B. General Conditions
- C. Section 01500—Construction Facilities and Temporary Controls

1.3 CLOSEOUT PROCEDURES

- A. Comply with requirements stated in Conditions of the Contract and in specifications for administrative procedures in closing out the Work

- B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection
- C. Provide submittals to Engineer/Owner that are required by governing or other authorities
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection
- B. Clean site; sweep paved areas
- C. Remove waste and surplus materials, rubbish, and construction facilities from the site

1.5 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Project record documents
- B. Evidence of payment and waiver of claims: As specified in the Contract Conditions
- C. Two copies of each specified special bond, warranty, and service contract
- D. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval
- E. At Contract close-out, deliver Record Documents to Engineer for the Owner
- F. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document
 - 5. Signature of Contractor or his authorized representative

1.6 PROJECT RECORD DOCUMENTS

- A. Provide project record documents under provisions of Section 01720
- B. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other Modifications to the Contract
 - 5. Reviewed shop drawings, product data, and samples

6. Field test reports
 7. Construction photographs
- C. Store Record Documents and samples separate from documents used for construction
1. Provide files and racks for storage of documents
 2. Provide locked cabinet or secure storage space for samples
- D. Record information concurrent with construction progress
1. Do not conceal any work until required information is recorded
 2. Legibly mark to record actual construction
- E. Specifications and Addenda—Legibly mark and record at each Product section description of actual Products installed, including the following:
1. Manufacturer's name, product model, number, trade name and supplies
 2. Product substitutions or alternates utilized
 3. Changes made by Addenda, field order or change order
- F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish floor datum
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work
 4. Field changes of dimension and detail
 5. Details not on original Contract Drawings
 6. Changes made by Field Order or by Change Order
- G. Submit documents to Engineer with claim for final Application for Payment
- H. File documents and samples in accordance with Data Filing Format of the Uniform Construction Index
- I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes
- J. Make documents and samples available at all times for inspection by Engineer
- K. Label each document "Project Record" in neat, large printed letters

1.7 SUBSTANTIAL COMPLETION

- A. When Contractor considers the Work is substantially complete, he shall submit to Engineer:
1. A written notice that the Work or designated portion thereof is substantially complete
 2. A list of items to be completed or corrected

- B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion
- C. Should Engineer determine that the Work is not substantially complete:
 - 1. Engineer will promptly notify the Contractor in writing, giving the reasons therefore
 - 2. Contractor shall remedy the deficiencies in the Work and send a second written notice of substantial completion to Engineer
 - 3. Engineer will reinspect the Work
- D. When Engineer finds that the Work is substantially complete, he will:
 - 1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final payment
 - 2. After consideration of any objections made by the Owner as provided in Conditions of the Contract and when Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected
- E. Final payment will not be made until all specified spare parts, maintenance materials, and special tools have been delivered to Owner in acceptable condition

1.8 FINAL INSPECTION

- A. When Contractor considers the Work is complete, he shall submit written certification that:
 - 1. Contract Documents have been reviewed
 - 2. Work has been inspected for compliance with Contract Documents
 - 3. Work has been completed in accordance with Contract Documents
 - 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational
 - 5. Work is completed and ready for final inspection
- B. Engineer and Consultant will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification
- C. Should Engineer consider that the Work is incomplete or defective:
 - 1. Engineer will promptly notify the Contractor in writing listing the incomplete or defective work
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to Engineer that the Work is complete
 - 3. Engineer will reinspect the Work
- D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals

1.9 REINSPECTION FEES

- A. Should Engineer and Consultant perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 - 1. Owner will compensate Engineer for such additional services of Consultant
 - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor

1.10 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit a final statement of accounting to Engineer
- B. Statement shall reflect all adjustments to the contract sum:
 - 1. The original Contract Sum
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders
 - b. Deductions for uncorrected Work
 - c. Deductions for liquidated damages
 - d. Deductions for reinspection payments
 - e. Other adjustments
 - 3. Total Contract Sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due

1.11 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Maintenance of record documents. Throughout progress of Work, maintain an accurate record of changes in the Contract Documents, and, upon completion of Work, transfer recorded changes to set of Record Documents.

1.2 RELATED SECTIONS

- A. Include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
- B. Individual sections of Technical Specifications

1.3 SUBMITTALS

- A. Comply with pertinent provisions under Section 01340.
- B. Engineer's acceptance of the current status of Project Record Documents will be a prerequisite to Engineer's recommendation for payment of progress payments and final payment under the Contract.
- C. Prior to submitting each request for progress payment, secure Engineer's acceptance of the current status of the Project Record Documents.
- D. Prior to submitting request for final payment, submit the final Project Record Documents to Engineer for acceptance.

1.4 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of Record Documents to one person on Contractor's staff acceptable to Engineer.
- B. Accuracy of records:
 - 1. Thoroughly coordinate changes within Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
 - 2. Accuracy of records shall be such that future searches for items shown in the Contract Documents may rely reasonably on information obtained from accepted Project Record Documents.

- C. Make entries within 24 hours after receipt of information that the change has occurred.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Maintain job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
- B. In the event of loss of recorded data, use means necessary to again secure the data for Engineer's acceptance.
 - 1. Such means shall include, if necessary in the opinion of Engineer, removal and replacement of concealing materials.
 - 2. In such case, provide replacement to the standards originally required by the Contract Documents.

PART 2 PRODUCTS

2.1 RECORD DOCUMENTS

- A. Job set: Promptly following receipt of Owner's Notice to Proceed, secure from Engineer at no charge to Contractor one complete set of all Documents comprising the Contract.
- B. Final Record Documents: At a time nearing the completion of the Work, secure from Engineer at no charge to Contractor one complete set of blueline copies of all Drawings in the Contract.

PART 3 EXECUTION

3.1 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of job set, identify each of the Documents with the title, "RECORD DOCUMENTS—JOB SET"
- B. Preservation:
 - 1. Devise a suitable method acceptable to Engineer for protecting job set, considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed.
 - 2. Do not use job set for any purpose except entry of new data and for review by Engineer, until start of transfer of data to final Project Record Documents.
 - 3. Maintain job set at the site of Work as that site is designated by Engineer.
- C. Making entries on Drawings:
 - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
 - 2. Date all entries.
 - 3. Call attention to the entry by a "cloud" drawn around the area or areas affected.

4. In the event of overlapping changes, use different colors for the overlapping changes.

D. Make entries in pertinent other Documents accepted by Engineer.

3.2 FINAL PROJECT RECORD DOCUMENTS

- A. The purpose of final Project Record Documents is to provide factual information regarding all aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination
- B. Acceptance of recorded data prior to transfer:
 1. Following receipt of blueline copies for Final Record Documents, and prior to start of transfer of recorded data thereto, secure Engineer's acceptance of all recorded data.
 2. Make required revisions.
- C. Transfer of data to Drawings:
 1. Carefully transfer change data shown on job set of Record Drawings to the corresponding bluelines, coordinating the changes as required.
 2. Clearly indicate at each affected detail and other Drawing, a full description of changes made during construction, and the actual location of items to be located.
 3. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 4. Make changes neatly, consistently, and with the proper media to assure longevity and legibility.
- D. Transfer of data to other Documents:
 1. If Documents other than Drawings have been kept clean during progress of Work, and if entries thereon have been orderly and acceptable to Engineer, the job set of those Documents other than Drawings will be accepted as final Record Documents.
 2. If any such Document is not acceptable to Engineer, secure a new copy of that Document from the Engineer at Engineer's usual charge for reproduction and handling, and carefully transfer the changed data to the new copy for acceptance by Engineer.
- E. Review and submittal:
 1. Submit completed set of Project Record Documents to Engineer as described above and under provisions of Section 01340.
 2. Participate in review meetings as required.
 3. Make required changes and promptly deliver final Project Record Documents to Engineer.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

- A. Clearing, grubbing and site preparation
- B. Removal and disposal of debris
- C. Handling, storage, transportation, and disposal of excavated material
- D. Sheeting, shoring, bracing and protection work
- E. Pumping and dewatering as required or necessary
- F. Backfilling
- G. Pipe embedment
- H. Construction of fills and embankments
- I. Trench Stabilization
- J. Final grading
- K. Slope Stabilization
- L. Erosion Control and Stormwater Management Plan
- M. Appurtenant work

1.2 RELATED SECTIONS

- A. Section 02667 – Site Water Lines

1.3 REFERENCES

- A. ASTM C33—Concrete Aggregates
- B. ASTM C136—Sieve Analysis of Fine and Coarse Aggregates
- C. ASTM D1241—Material for Soil Aggregate Subbase, Base and Surface Courses

- D. ASTM D698—Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb Rammer and 12-Inch Drop
- E. ASTM D1557—Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18 inch drop
- F. ASTM D4253—Test Methods for Maximum Index Density of Soils Using a Vibratory Table
- G. ASTM D4254—Test Methods for Minimum Index Density of Soils and Calculations of Relative Density
- H. ASTM D2922—Test Methods for Density of Soil and Soil-Aggregate Mixtures in Place by Nuclear Methods (Shallow Depth)
- I. ASTM D3017—Test Method for Moisture Content of Soil and Soil-Aggregate Mixtures

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Product Data: Submit on all products or materials supplied herein
- C. Test Reports: Indicate sieve analysis, optimum moisture content and density in accord and with ASTM D698 for cohesive soils including onsite native material. Indicate supplier, sieve analysis, and maximum relative density in accord with ASTM D4253 and D4254 for crushed rock or gravel, pipe embedment and other cohesionless material for fills and embankment

1.5 REGULATORY REQUIREMENTS

- A. Comply with all requirements of City of Loveland Erosion Control Permit and State Construction Dewatering Permit

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling
- B. Protect work from erosion or other similar types of damage until the project has been completed
- C. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when temperature is 35 degrees F and rising
- D. Do not use frozen materials, snow, or ice in any backfill or fill area

- E. Do not backfill or construct fill on frozen surfaces
- F. Protect excavated material from becoming frozen
- G. Do not remove trees from outside excavation or fill areas unless authorized by the Engineer; protect from permanent damage by construction activities
- H. Provide temporary bridges for roadways, walkways, driveways, etc.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Classification of Excavated Materials:
 - 1. None
 - 2. Remove and handle excavated materials regardless of type, character, composition, condition, or depth of material at no additional cost to Owner
 - a. Remove and handle excavated materials regardless of means, methods and techniques required, at no additional cost to Owner
- B. Fills and Embankments:
 - 1. To the max extent practical use excess earth from excavation for fills and embankments
 - 2. Obtain additional material from borrow areas as necessary
 - 3. Free from rocks or stones larger than 6 inch in greatest dimension and free from brush, stumps, logs, roots, debris, and organic and other deleterious materials
 - 4. Fill and embankment material acceptable to Engineer
 - 5. Where allowed, distribute rocks and stones through the fill to not interfere with compaction
- C. Topsoil:
 - 1. Native material removed and stockpiled before excavation
 - 2. Free from trash, debris, surface vegetation more than 6 inch high
- D. Pipe Embedment: Graded gravel:
 - 1. Washed rock conforming to ASTM C33:

Sieve Size (Inch)	Percent Passing by Weight
3/8"	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60

#50	10-30
#100	2-10

E. Stabilization Material: Crusher-run rock:

1. Crusher-run rock conforming to ASTM D448:

Sieve Size (Inch)	Percent Passing by Weight
2"	95-100
1"	35-70
½"	10-30
#4	0-5

F. Compacted Trench Backfill:

1. Job excavated material finely divided, free of debris, organic material, and stones larger than 3 inch in greatest dimension without masses of moist, stiff clay
2. Graded gravel: As specified for pipe embedment

G. Trench Cover:

1. Free of brush, debris and roots
2. May contain rubble and detritus from rock excavation, stones and boulders if well separated and arranged not to interfere with backfill settlement
3. In upper 18 inch no rock or rock excavated detritus except with specific approval of Engineer
4. No stones larger than 8 inch in greatest dimension within 3 feet of top of pipe

H. Compacted Structural Backfill:

1. Earth only, free of wood, grass, roots, broken concrete, stones, trash, or debris of any kind
2. Moisture content uniformly distributed and such that max density of compacted soil will be obtained

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 PERFORMANCE - GENERAL

- A. Perform work in a safe and proper manner with appropriate precautions against hazard

- B. Provide adequate working space and clearances for work performed within excavations and for installation and removal of concrete forms
- C. Do not undercut excavation faces for extended footings
- D. Clean subgrades of loose material before concrete is placed thereon

3.3 PREPARATION

- A. Clear sites to be occupied by permanent construction of roots, brush, and other objectionable material and debris
- B. Clean and strip subgrade for fills and embankments of surface vegetation, sod, tree stumps and organic topsoil
- C. Remove waste materials from site and dispose
- D. Remove debris, all trees, underbrush, stumps, roots and other combustible materials from site daily and dispose of off-site; on-site burning is not permitted
- E. Do not use open burning

3.4 TOPSOIL

- A. Remove and stockpile existing topsoil surface
- B. At the completion of other work in each area, place and grade topsoil to maintain gradient as indicated

3.5 DEWATERING

- A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the work
- B. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result
- C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation
- D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property
- E. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup

- F. Obtain and comply with conditions of CDPHE construction dewatering permit.

3.6 SHEETING, SHORING AND BRACING

- A. Provide proper and substantial sheeting, shoring, and bracing, as required, to prevent caving or sliding of existing facilities, to protect workmen and the Work, and to protect existing structures and facilities
- B. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances
- C. Do not pull trench sheeting before backfilling unless pipe strength is sufficient, to carry trench loads based on trench width to the back of sheeting
- D. Do not brace sheeting left in place against the pipe, but support it in a manner that precludes concentrated loads or horizontal thrusts on pipe
- E. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed

3.7 TRENCH STABILIZATION

- A. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities
- B. Remove all mud and muck during excavation
- C. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities
- D. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on drawings
- E. Allow no more than 2 inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon

3.8 TRENCH EXCAVATION

- A. Establish alignment and grade or elevation from offset stakes
- B. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the drawings
- C. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection

- D. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation
- E. Limiting trench widths:
 - 1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment
 - 2. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than 1 foot above the top of the pipe
 - 3. Stipulated minimum clearances are minimum clear distances, not minimum average distances
 - 4. Max trench width from 6 inch above the top to trench bottom of the installed pipe: Pipe O.D. plus 24 inches
 - 5. Limiting trench widths and permissible clearances from 6 inches above top of pipe to trench bottom for installed piping as shown on project plans
 - 6. If the width of the lower portion of the trench exceeds the max permitted, provide pipe of adequate strength, special pipe embedment, or arch concrete encasement as required by loading conditions and as determined by Engineer
- F. Mechanical excavation:
 - 1. Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas
 - 2. Use mechanical equipment of a type, design, and construction and operated so that:
 - a. Rough trench bottom elevation can be controlled
 - b. Uniform trench widths and vertical sidewalls are obtained from 1 foot above the top of the installed pipe to the bottom of the trench
 - c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls
 - 3. Do not undercut trench sidewalls
 - 4. Recompect trench bottom disturbed by bucket teeth prior to placement of embedment material
- G. Except as otherwise required, excavate trenches below the underside of pipes as indicated in the drawings to provide for installation of granular embedment pipe foundation material
- H. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided or the trench may be graded to provide uniform and continuous support (between bell holes or end joints) of the installed pipe, Contractor's option
- I. Whenever so directed by Engineer, excavate to such depth below a grade as Engineer directs and bring the trench bottom to grade with such material as Engineer may direct

- J. Provide concrete, or other foundations made necessary by unstable soil as directed by Engineer
- K. Excavate to provide adequate clearance for tools and methods of pipe installation
- L. Do not allow any of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined

3.9 PIPE EMBEDMENT

- A. Embed pipes above and below the bottom of pipe as indicated in the drawings and as specified
- B. Spread and surface grade granular embedment to provide continuous and uniform support beneath pipe at all points between pipe joints
- C. After grading, aligning, and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe and to hold the pipe in proper position and alignment during subsequent operations
- D. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent lateral displacement
- E. Granular embedment:
 - 1. Compact by slicing with shovel or vibrating
 - 2. Maximum uncompacted thickness of layers: 6 inch
- F. Compacted embedment:
 - 1. Maximum uncompacted thickness of layers: 8 inch
 - 2. Compact to 95 percent max density as determined by ASTM D698
 - 3. Compact to 70 percent relative density ASTM D4253/D4254

3.10 TRENCH BACKFILL

- A. Compacted backfill:
 - 1. For full depth of trench above embedment
 - 2. Beneath pavements, surfacing, driveways, curbs, gutters, walks or other surface construction or structures
 - 3. In street or highway shoulders
 - 4. In established sodded areas
 - 5. Beneath fills and embankments
- B. Where the trench for 1 pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench
- C. Place job excavated materials in 8 inch max uncompacted thickness, uniform layers

- D. Increased layer thickness may be permitted for uncohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved
- E. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe
- F. Compact to 95 percent of max density within 2 percent (+/-) optimum moisture content per ASTM D698 or to an equivalent percent relative density per ASTM D4253/D4254 when appropriate
- G. Graded gravel:
 - 1. Deposit in uniform layers of 8 inch max uncompacted thickness
 - 2. Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253/D4254
- H. Uncompacted backfill:
 - 1. Compaction of backfill above pipe embedment in locations other than those specified, is required only to prevent future settlement
 - 2. May be placed by any method acceptable to Engineer which will not impose excessive concentrated or unbalanced loads, shock, or impact on, and will not result in displacement of installed pipe
 - 3. Do not drop compact masses of stiff clay or other consolidated material more than 5 feet into trench unless cushioned by 2 feet minimum of loose backfill above pipe embedment
- I. Finish the top portion of backfill with topsoil corresponding to, or better than, that underlying adjoining sodded areas

3.11 DISPOSAL OF EXCESS EXCAVATED MATERIALS

- A. Use excess excavated materials in fills and embankments as indicated on the drawings to the extent needed
- B. Dispose of suitable excess excavated materials at location referenced at the end of this section
- C. Remove debris, junk, broken concrete, broken asphalt, rock, stones, stumps, logs, roots, and other unsuitable material from the site and dispose of it

3.12 FINAL GRADING

- A. After completion of all other outside work and after backfilling is completed and settled, bring to grade at the indicated contours
- B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work

- C. Grade all surfaces for effective drainage
- D. Grade and surface to maintain gradient as indicated

3.13 STORMWATER MANAGEMENT PLAN

- A. Submit General Permit Application to CDPHE for stormwater discharges associated with construction activity and comply with all conditions of the permit

3.14 SETTLEMENT

- A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from final completion of Contract under which Work is performed
- B. Repair or replace within 30 days after notice by Engineer or Owner

3.15 FIELD QUALITY CONTROL

- A. Owner shall coordinate and pay for all tests to determine compliance of in-place and backfill materials and compaction in accordance with the specifications

END OF SECTION

SECTION 02511

RECYCLED ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Recycled asphalt paving course, compacted

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork: Rough grading

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340

PART 2 PRODUCTS

2.1 MATERIALS

- A. Comply with the applicable provisions of the Colorado Department of Transportation (CDOT) "Standard Specifications for Road and Bridge Construction" in accordance with recycled asphalt materials, except as specified herein

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

- A. Compact top 6" of access road subgrade to at least 95 percent of max density at optimum moisture content in accordance with ASTM D698
- B. Remove all unsuitable or objectionable material and replace with acceptable material
- C. Fill all holes and ruts with suitable material
- D. Thoroughly wet, reshape and roll subgrade to extent needed to place subgrade in acceptable conditions
- E. Construct subgrade to accommodate elevations and gradients indicated

3.2 INSPECTION

- A. Verify compacted subgrade is dry and ready to receive work of this Section
- B. Verify gradients and elevations of base are correct

- C. Beginning of installation means acceptance of existing conditions

3.3 PLACING STONE PAVING

- A. Spread recycled asphalt over prepared subgrade to a total compacted thickness of 6 inches
- B. Place in minimum 3 inch layers evenly and compact to 95 percent density at optimum moisture content in accordance with ASTM D698
- C. Level surfaces to elevations and gradients indicated
- D. Maintain surface shape elevation and smoothness throughout the operation by blading and adding material if required

3.4 FIELD QUALITY CONTROL

- A. The Owner shall pay for all field tests to determine compliance of subgrade preparation and compaction in accordance with the specifications

END OF SECTION

SECTION 02667

WATER LINES, VALVES AND SPECIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and fittings for project water lines.
- B. Valves, fittings and specials.

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork
- B. Section 02675—Disinfection of Water Distribution Systems

1.3 REFERENCES

- A. AWWA C104—Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. AWWA C105—Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids
- C. AWWA C110—Ductile-Iron and Gray-Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids
- D. AWWA C111—Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings
- E. AWWA C150—Thickness Design of Ductile-Iron Pipe
- F. AWWA C151—Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
- G. AWWA C153—Ductile-Iron Compact Fittings, 3 Inch through 12 Inch, for Water and Other Liquids
- H. AWWA C500—Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems
- I. AWWA C504—Rubber Seated Butterfly Valves
- J. AWWA C509—Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems
- K. AWWA C600—Installation of Ductile-Iron Water Mains and Appurtenances

- L. AWWA C606—Grooved and Shouldered Type Joints
- M. AWWA C900 — AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
- N. AWWA C905—Standard for Polyvinyl Chloride (PVC) Pressure Pipe “Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-inch through 48-inch, for Water Transmission and Distribution”.
- O. NSF 61—Drinking Water System Components—Health Effects

1.4 SYSTEM DESCRIPTION

- A. Provide piping complete with all fittings, jointing materials, supports, anchors and necessary appurtenances

1.5 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Shop Drawings: Provide piping layout fabrication and assembly drawings with fitting dimensions. Provide sufficient information to verify compliance with specifications
- C. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturer's catalog information with dimensions, material and assembled weight. Indicate pressure ratings for pipe, valves and hydrants
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements
- E. Test Reports: Submit reports of field pressure tests under provisions of appropriate Section

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700
- B. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities

1.7 REGULATORY REQUIREMENTS

- A. Conform to all municipal codes and ordinances, laws and regulations of the state
- B. In case of apparent conflict, state and local requirements govern over these specifications

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under manufacturer's recommendations.
- B. Deliver and store valves and accessories in shipping containers with labeling in place in accordance with AWWA C500
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation
- D. Seal valve ends to prevent entry of foreign materials into valve body
- E. During loading, transporting and unloading, exercise care to prevent damage to material
 - 1. Use slings, hooks, pipe tongs, or skids
 - 2. Do not drop pipe or fittings
 - 3. Do not roll or skid against pipe already on ground
 - 4. Repair any damage done to coating or lining
 - 5. Handle per manufacturer's recommendations
 - 6. Store rubber gaskets in cool dark location
 - 7. Store all material on wood pallets or timbers
- F. Adequately tag or otherwise mark all piping and fittings as to size

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE

- A. ANSI A21.51/AWWA C151: As listed below except as otherwise specified or indicated on Drawings
 - 1. Where fitted with push-on joints, mechanical joints or mechanical joints with joint restraint device or restrained joints: less than or equal to 12" Pressure Class 350, greater than 12" Pressure Class 250
- B. Fittings
 - 1. Ductile iron: ANSI A21.10/AWWA C110
 - a. 12 inch and below: 350 psi rating
 - b. Greater than: 250 psi rating
- C. Joints
 - 1. Mechanical joints: ANSI A21.11/AWWA C111
 - a. Bolts and nuts: High strength, low alloy steel, "Cor-Ten" or approved equal
 - 2. Mechanical joints with tie rods
 - a. Tie rods: ASTM A307
 - b. Steel pipe spacers: ASTM A120, standard weight
 - c. Washers: ANSI A27.2 plain steel

- d. Plastic plugs: As recommended by pipe manufacturer

2.2 PVC PIPE:

A. AWWA C905 DR 21:

1. Fittings: AWWA C111, cast iron
2. Joints: ASTM D3139 compression gasket ring
3. Tracer Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Water Service" in large letters

B. AWWA C900 DR 14:

1. Fittings: AWWA C111, cast iron
2. Joints: ASTM D3139 compression gasket ring
3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Water Service" in large letters

2.3 GATE VALVES— THROUGH 12 INCHES

- A. Per City of Loveland Standards and Specifications

2.4 FLANGED COUPLING ADAPTERS

- A. 12 inch and under: Rockwell "type 912, "Dresser style 127" or equal

2.5 AIR RELEASE VALVE

- A. 1" Combination Air and Vacuum Release, APCO Williamette Model 143C with isolation ball valve.

2.6 BEDDING MATERIALS

- A. Bedding: As specified in Section 02200

2.7 ACCESSORIES

A. Valve boxes for all buried valves, depth as required for valve

1. Cast iron extension sleeve type with boxes and covers
2. Minimum diameter: 5 inch
3. Minimum thickness: 3/16 inch
4. Box, cover, and base coated by dipping in asphalt varnish
5. An appropriate word designating the valve service on the cover

B. Concrete for Thrust Blocks: Per City of Loveland Standards and Specifications

- C. Joint Restraint: For PVC pipe, shall be full concentric circle "type" restraint. For DIP, may be either full concentric circle or wedge load restraint.

2.8 RATE OF FLOW CONTROL VALVE

A. General:

1. Tight shutoff under no flow conditions
2. No "hunting" under normal flow conditions
3. Sized and selected as recommended by the valve manufacturer

B. Water Service:

1. Provide as indicated on Drawings
2. Max flow greater than 150 gpm: pilot operated, Cla-Val 90-01, GA 45, OCV 127-3, or accepted substitution

2.9 CORROSION CONTROL

A. Paint all ferrous metal surfaces of valves and accessories (including joint restraint all-threads) for corrosion protection with rust inhibitive primer: Tnemec "Series 77 Chem-Prime," Sherwin Williams "Ken Kromick Universal Metal Primer," or equal

B. Polyethylene encasement: AWWA C105: seamless tube, ASTM D1248, Type I, Class C, Grade E-1, 8 mils thick

1. Joint tape: Self-sticking, PVC or polyethylene, 2-inch wide, 10 mils thick, Chase "Cahsekote 750," Kendall "Polyken 900," 3M "Scotchrap 50," or equal
2. Strapping: Nonmetallic, water resistant, FS PPP-S-760, Type II
3. Harness rods shall be covered by 4-inch flat width polyethylene tubing. The entire joint shall be covered by a complete wrap of 48-inch wide polyethylene sheet material cover over each set of lugs

C. Cathodic protection: as shown on plans

PART 3 EXECUTION

3.1 EXAMINATION

- A. Carefully examine pipe and fittings for cracks, damage to linings, and other defects prior to installation
- B. Remove all defective pipe from site and replace
- C. Examine areas for weak or structural defects or deviations beyond allowable tolerances for piping clearances that adversely affect excavation and quality of Work
- D. Start installation only when conditions are satisfactory

3.2 PREPARATION

- A. Ream pipe and tube ends and remove burrs

- B. Remove scale and dirt, on inside and outside, before assembly
- C. Prepare pipe connections to equipment with flanges or unions
- D. Thoroughly inspect and clean interior of fire hydrants. Open and close hydrant to insure parts are in working order, the valves seat properly and the drain valve operates
- E. Check packing gland and gland nut of fire hydrant for proper installation

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02200 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated
- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to 90 percent standard proctor

3.4 INSTALLATION—PIPE

- A. Install as specified or in accordance with the manufacturer's recommendations
- B. Protect from lateral displacement by placing embedment evenly on both sides of pipe
- C. Do not lay pipe in water. Do not lay pipe under unsuitable weather or trench conditions
- D. Lay pipe with bell ends facing the direction of laying except when Engineer authorizes reverse laying
- E. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main
- F. Establish elevations of buried piping to ensure not less than 5 ft of cover
- G. Backfill trench in accordance with Section 02200
- H. Install tracer wire continuous along pipeline; reference details
- I. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system

3.5 INSTALLATION—VALVES

- A. Install valves, hydrants, and accessories in accordance with the manufacturer's recommendations
- B. Set valves on solid bearing
- C. Center and plumb valve box over valve.

- D. Extend stem within 6 inches of final grade. Provide spacers to center stem in valve box

3.6 WET-TAP CONNECTION TO EXISTING LITTLE THOMPSON PIPELINE

- A. Wet-tap shall be completed in accordance with requirements of section 601.5 of LTWD water line standards. The following is an excerpt from the full LTWD specification.

B. Fabricated Steel Mechanical Joint Tapping Sleeves

1. The fabricated steel sleeve shall consist of a two part fabricated cylinder, with fusion bonded epoxy coating in accordance with AWWA Standard C550.
2. All steel plate used in fabrication of the steel tapping sleeves shall conform to ASTM A36 or A285, Grade C.
3. Flanges shall be fabricated from steel plate and all dimensions shall conform to AWWA Standard C207 Class D.
4. Flanges shall be machined to a flat rate with finish of 250 micro inches or machined to a flat surface with a serrated finish in accordance with AWWA Standard C207. The machined face shall also be recessed for tapping valves.
5. Bolts and nuts shall be carbon steel, ASTM grade B or Type 304 stainless steel.

C. Installation

1. Tapping saddles and sleeves shall be installed in accordance with the manufacturer's recommendation.
2. Prior to installation, all coatings, oil, scale, and dirt shall be removed from the saddle and pipe to provide a clean seat for the gasket.
3. The gasket shall be wiped clean prior to installation.
4. Final nut tightening shall be performed with a torque-limiting wrench to the torque level recommended by the manufacturer.
5. Tapping Procedure
 - a. Prior to any wet tap, the Contractor shall provide the District with a minimum of 24 hours advance notice. All wet taps four (4) inches and larger shall be accomplished under the supervision of the Designated District Representative.
 - b. Separation

Tap saddles and sleeves shall be a minimum of three (3) feet from the nearest pipe joint.
 - c. Tapping sleeves shall be tested to the manufacturer's specifications.
 - d. The tapping valve shall be supported with blocks prior to attaching the tapping machine to the valve.
 - e. The thrust block shall be poured prior to any water entering the new water line through the wet tap.
 - f. Tapping equipment shall be of good quality, used for the purpose intended and used in accordance with the manufacturer's instructions.
 - g. The coupon from the wet tap shall be turned over to the District at the conclusion of the tap.

- C. Provide facilities for adequate dewatering and disposal of water from dewatered line and excavations without damage to adjacent property
- D. Potable water lines
 1. Take special care to prevent contamination
 2. Do not permit trench water, mud, or other contaminating substances in lines

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 02675

3.8 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/4 inch per foot, two percent minimum but never less than 1/8 per inch per foot. Maintain gradients
- B. Slope exposed water piping and arrange to drain at low points

3.9 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed on all new piping
- B. Test each line at the Contractor's expense in the presence and to the satisfaction of Engineer
- C. Provide all necessary pumping equipment, piping connections, pressure gauges with maximum of 5 psi increments, and other required equipment, facilities, and materials
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner
- E. Hydrostatic Test Conditions

<u>Service</u>	<u>Test Pressure</u>	<u>Test Medium</u>
Project Piping	150 psi	Water

- F. Procedure
 1. Plug or cap ends as required
 2. Bleed system to eliminate all air from system
 3. No testing before concrete thrust blocks have adequate curing time, 7 days minimum
 4. Notify Engineer 48 hours prior to testing
 5. Test for 2 hours with no more than 5 psi loss in pressure
 6. Leakage is the quantity of water added to a test section to maintain test pressure \pm 5 psi
 - a.
$$L = \frac{S \times D \times (P)^{0.5}}{133,200}$$

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = avg. test pressure during the test, in psi (gauge)

- b. All visible leaks shall be stopped to the satisfaction of the Engineer
 - c. All water used for pressure testing must be potable and delivered in acceptable containers
7. Immediately locate and replace all pipe fittings, valves, pipe joints, and other materials found to be defective with new and acceptable material
- G. Owner will provide only water for initial filling and testing of pipeline
- H. Contractor will provide water for additional testing in accordance with City of Loveland rules, regulations and pricing structures.

END OF SECTION

SECTION 02675

DISINFECTION OF WATER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Disinfection of potable water system
- B. Testing and reporting results

1.2 RELATED SECTIONS

- A. Section 02667—Site Water Lines

1.3 REFERENCES

- A. ANSI/AWWA B300—Standard for Hypochlorites
- B. ANSI/AWWA B301—Standard for Liquid Chlorine
- C. ANSI/AWWA B302—Standard for Ammonium Sulfate
- D. ANSI/AWWA B303—Standard for Sodium Chlorite
- E. ANSI/AWWA C651—Standards for Disinfecting Water Mains
- F. ANSI/AWWA C652—Standards for Disinfection of Water Storage Facilities
- G. NSF 60—Drinking Water Treatment Chemicals - Health Effects

1.4 SUBMITTALS

- A. Test Reports: Indicate results comparative to specified requirements
- B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700
- B. Disinfection report; record:
 - 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

C. Bacteriological report; record:

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 conforms, or fails to conform, to bacterial standards of Safe Drinking Water Act
8. Bacteriologist's signature and authority

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI/AWWA C651 and C652

1.7 QUALIFICATIONS

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years of documented experience
- B. Testing Firm: Company specializing in testing potable water systems and approved by the State of Colorado

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable local code or state regulation for performing the work of this Section

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that piping system has been cleaned, inspected and pressure tested

- B. Perform scheduling and disinfection activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems
- C. Complete disinfection after passing pressure tests

3.2 PRESSURE TESTING AND DISINFECTION

- A. Provide and attach required equipment to perform the work of this Section
- B. Pressure test system under provisions of Section 02667. Repair leaks and re-test
- C. Prior to starting work, verify system is complete, flushed and clean
- D. Inject treatment disinfectant, free chlorine in liquid form into piping system to obtain 50 to 80 mg/l residual
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual
- F. Maintain disinfectant in system for 24 hours
- G. If final disinfectant residual tests less than 25 mg/l, repeat treatment
- H. Flush, circulate and clean until residual equal to that of incoming water is achieved. Flushed water shall be thoroughly de-chlorinated prior to entering any water courses.
- I. Take samples no sooner than 24 hours after flushing, from outlets and from water entry, and analyze
- J. Replace permanent system devices removed for disinfection

END OF SECTION

SECTION 02936

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation of subsoil
- B. Placing topsoil
- C. Seeding, hydroseeding and fertilizing
- D. Maintenance

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork

1.3 REFERENCES

- A. FS O-F-241—Fertilizers, Mixed, Commercial

1.4 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

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Section 01700—Contract Closeout: Procedures for submittals

1.6 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging

1.7 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for herbicide composition
- B. Provide certificate of compliance from City of Loveland Parks and Recreation Department indicating approval of seed mixture

1.8 DELIVERY, STORAGE, AND PROTECTION

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

1.9 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for three cuttings

PART 2 PRODUCTS

2.1 SEED SUPPLIERS

- A. Manufacturers:
 - 1. Arkansas Valley Seed Co.
- B. Provide the latest crop available in accordance with Colorado Department of Agriculture Seed Laws, Chapter 35, Article 27
- C. Compensate for percentage of purity and germination by furnishing sufficient additional seed to equal the specified pure live seed product. The formula for determining the quantity of pure live seed (PLS) shall be:

$$\begin{aligned} &\text{Pounds of Seed (Bulk) X Purity X Germination =} \\ &\text{Pounds of Pure Live Seed (PLS)} \end{aligned}$$

2.2 RECLAMATION MIXTURES

- A. Elevations of 3,000 to 8,000 feet, natural cover under dryland conditions, cool and warm season grasses, cold and drought tolerant, for soil stabilization on poor soils.
 - 1. Buffalo Grass: 40 percent
 - 2. Sheep Fescue: 25 percent
 - 3. Blue Grama: 35 percent
 - 4. Seeding Rate:
 - a. Broadcast: 20 to 25 lbs. per acre
 - b. Drilled: 15 to 20 lbs. per acre

2.3 SOIL MATERIALS

- A. Topsoil: Excavated from site and free of weeds.

2.4 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.
- B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of existing topsoil
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.5 TESTS

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to a depth of 3 where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

- A. Spread topsoil over area to be seeded. Rake until smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.4 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.

3.5 SEEDING

- A. Apply seed at a rate of 100 lbs per acre 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. Roll seeded area with roller not exceeding 112 lbs.
- E. Immediately following seeding and compacting, apply mulch to a thickness of 2.5 tons per acre.
- F. Apply water with a fine spray immediately after each area has been mulched.

3.6 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 3 inches.
- B. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- C. Immediately reseed areas which show bare spots.

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grouting of equipment as shown on drawings
- B. Grouting annulus between wall sleeves and wall pipes
- C. Patching cavities in concrete

1.2 REFERENCES

- A. ASTM C109—Test Method for Compressive Strength of Hydraulic Cement Mortar
- B. ASTM C157—Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
- C. ASTM C191—Time of Setting of Hydraulic Cement by Vicat Needle

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Product Data: Provide manufacturer's catalog sheet for material indicating test data and physical properties

1.4 QUALITY ASSURANCE

- A. Conform to applicable industry standard, Corps of Engineers, Specification CRD-C 621—Specification for non-shrink grout

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hydraulic Grout
 - 1. Thoro Consumer Products—Waterplug®
 - 2. Or approved equal
- B. Epoxy/Grout Adhesive
 - 1. Sika—Sikadur 32 Hi-Mod LPL
 - 2. Or approved equal

2.2 MATERIALS

- A. Hydraulic Grout: Factory premixed cement based, quick set hydraulic cement.
- B. Epoxy/grout adhesive
 - 1. Two components consisting of a resin and hardener
 - 2. Each component furnished in separate tubes within cartridge
- C. Water: Clean and free from deleterious substances

PART 3 EXECUTION

3.1 PREPARATION

- A. Hydraulic Grout
 - 1. Clean concrete surface to receive grout
 - 2. Follow manufacturer's installation recommendations
 - 3. Apply to clean, sound surface
- B. Epoxy Grout Adhesive: Apply only to clean, dry, sound surface

3.2 APPLICATION

- A. Hydraulic Grout
 - 1. Use no more water than necessary to produce flowable grout
 - 2. Completely fill all spaces between the outside of the pipe and the inside of the wall casting along the entire length of the wall casting.
 - 3. Provide forms where appropriate to confine grout
 - 4. Where exposed to view finish grout edges smooth
 - 5. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound
 - 6. Obtain manufacturer's field technical assistance as required to insure proper placement
- B. Epoxy/grout adhesive
 - 1. Drill hole to proper diameter and depth
 - 2. Clean hole
 - 3. Dispense adhesive into hole
 - 4. Insert dowel or threaded rod, slowly turning during insertion
 - 5. Obtain manufacturer's field technical assistance as required to insure proper placement

END OF SECTION

SECTION 15062

DUCTILE IRON PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide ductile iron piping, 3-inches and larger, complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances for a complete and functional system.

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork

1.3 REFERENCES

- A. ANSI B16.1—Cast Iron Pipe and Flanges and Flanged Fittings, Class 25, 125, 250, and 800
- B. AWWA C104—Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- C. AWWA C105—Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
- D. AWWA C110—Ductile-Iron and Gray-Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids
- E. AWWA C111—Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- F. AWWA C115—Flanged Ductile-Iron Pipe with Threaded Flanges
- G. AWWA C150—Thickness Design of Ductile-Iron Pipe
- H. AWWA C151—Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- I. AWWA C153—Ductile-Iron Compact Fittings, 3 Inch through 16 Inch, for Water and Other Liquids
- J. AWWA C600—Installation of Ductile-Iron Water Mains and Appurtenances
- K. AWWA C606—Grooved and Shouldered Joints
- L. AWWA C651—Disinfecting Water Mains
- M. NSF 61—Drinking Water System Components—Health Effects

1.4 SYSTEM DESCRIPTION

- A. Provide piping complete with all fittings, jointing materials, supports, anchors as necessary

1.5 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Shop Drawings: Provide piping layout fabrication and assembly drawings with fittings dimensions. Provide sufficient information to verify compliance with plans and specifications
- C. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturer's catalog information with dimensions, material and assembled weight. Indicate pressure ratings for pipe and appurtenances
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements
- E. Test Reports: Submit proposed method and reports of field pressure tests to Owner

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01720
- B. Accurately record actual locations of piping, fittings, valves, connections, and top of pipe elevations
- C. Identify and describe uncharted utilities

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with these specifications and Town of Windsor Standards and Specifications
- B. Manufacturer's name and pressure rating marked on piping and fittings

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation
- B. During loading, transporting, unloading, and installation, exercise care to prevent damage to material
 - 1. Use nylon slings only
 - 2. Do not drop pipe or fittings
 - 3. Do not roll or skid against pipe already on ground
 - 4. Repair any damage done to coating or lining

5. Handle per manufacturer's instructions
6. Store rubber gaskets in cool dark location
7. Store all material on wood pallets or timbers

C. Adequately tag or otherwise mark all piping and fittings as to size

PART 2 PRODUCTS

2.1 MANUFACTURERS—DUCTILE IRON PIPE

- A. Griffin Pipe Products Company
- B. Tyler Pipe
- C. U.S. Pipe and Foundry

2.2 DUCTILE IRON PIPE

A. AWWA C151 Class 350

B. Fittings

1. Ductile iron: ANSI A21.10/AWWA C110, ASTM A536, Grade 80-60-03 or 70-50-05
 - a. 350 psi rating, mechanical joint or flanged

C. Joints

1. Mechanical joints: ANSI A21.11/AWWA C111
 - a. Bolts and nuts: High strength, low alloy steel, "Cor-Ten" or approved equal
2. Mechanical joints with tie rods
 - a. Tie rods: ASTM A307, galvanized entire length
 - b. Steel pipe spacers: ASTM A120, standard weight galvanized
 - c. Washers: ANSI A27.2 plain steel, galvanized
3. Flanged joints
 - a. Flanges
 - 1) General use: ANSI A21.15/AWWA C115 and ANSI B16.1, Class 125
 - 2) Where 250 psi working pressure indicated on Drawings or specified: ANSI 21.15/AWWA C115
 - 3) Where Class 250 indicated on Drawings or specified: ANSI B16.1, Class 250, flat faced
4. Push-on joints: ANSI A21.11/AWWA C111, except gaskets shall be neoprene or other synthetic rubber. Natural rubber is not acceptable
 - a. Lubricant: Heavy vegetable soap solution suitable for potable water contact
 - b. Pressure rated 350 psi
5. Restrained push-on joints

- a. 24 inch and below: Griffin "Snap-Lok", U.S. Pipe "TR-Flex", or equal
- 6. Restrained mechanical joints
 - a. 24 inch and below: Griffin "Bolt-Lok", or equal
- 7. Mechanical joint with restraint device:
 - a. Multiple wedging action type
 - b. Twist off nuts used to insure proper actuating of the restraining device
 - c. Working pressure rated to at least 250 psi
 - d. EBAA Iron Sales, Inc., MEGA LUG or equal
 - e. Use Mechanical MegaLug with conventional thrust block restraint and where acceptable to Engineer

2.3 CORROSION CONTROL

- A. Shop paint all ferrous interior and exterior pipe fittings and accessory surfaces for corrosion protection
- B. Shop lining for pipe and fittings: Cement-mortar, AWWA C104
- C. Bituminous coating
 - 1. Potable service interior coating: Manufacturer's Standard, AWWA C104 and NSF 61 approved
 - 2. Interior coating: Manufacturer's Standard, AWWA C104
 - 3. Exterior coating: Manufacturer's Standard, AWWA C104
- D. Polyethylene encasement: AWWA C105: Seamless tube, ASTM D1248, Type I, Class C, Grade E-1, 8 mils thick
 - 1. Joint tape: Self-sticking, PVC or polyethylene, 2-inch wide, 10 mils thick, Kendall "Polyken 900", 3M "Scotchrap 50", or equal
 - 2. Strapping: Nonmetallic, water resistant, FS PPP-S-760, Type II
 - 3. Harness rods shall be covered by 4-inch flat width polyethylene tubing. The entire joint shall be covered by a complete wrap of 40-inch wide polyethylene sheet material cover over each set of lugs

2.4 ACCESSORIES

- A. Concrete for thrust blocks or encasement: Concrete as specified in City of Loveland Construction Standards for Potable Water Systems

PART 3 EXECUTION

3.1 EXAMINATION

- A. Carefully examine pipe and fittings for cracks, damage to linings and coatings, and other defects prior to installation
- B. Remove all defective pipe from site and replace

- C. Examine areas for defects such as weak structural components or deviations beyond allowable tolerances for piping clearances that adversely affect execution and quality of Work
- D. Start installation only when conditions are satisfactory

3.2 BEDDING

- A. Excavate pipe trench in accordance with Section 02200 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated
- B. Place bedding material at trench bottom, level fill materials in one continuous layer per Section 02200

3.3 INSTALLATION

- A. Install as specified or in accordance with the manufacturer's instructions
- B. Cutting Pipe
 1. Cut pipe to measurements taken at the site, not from the Drawings
 2. Cut pipe neatly without damage to pipe or cement lining
 3. Cut smooth, straight, and at right angles to pipe axis
 4. Dress and bevel end of cut pipe to remove roughness and sharp corners, recoat exposed metal with coating approved for intended service
 5. Cut ductile iron pipe with saw or abrasive wheel
- C. Piping Underground
 1. Install ductile iron piping and fittings in accordance with AWWA C600 except as specified herein
 2. Install pipe to indicated elevation to within tolerance of 1/2 inch
 3. Route pipe in straight line
 4. Install pipe to allow for expansion and contraction without stressing pipe or joints
 5. Protect from lateral displacement by placing embedment evenly on both sides of pipe
 6. Do not lay pipe in water. Do not lay pipe under unsuitable weather or trench conditions
 7. Lay pipe with bell ends facing the direction of laying except when Engineer authorizes reverse laying
 8. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.
 9. Backfill trench in accordance with Section 02200
 10. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system
- D. Piping in Structures
 1. Completed installation should present a neat, orderly appearance
 2. Run piping parallel to walls of building or structure

3. Keep piping from contacting walls, structures, or installed items

3.4 JOINTS

- A. Make joints carefully and neatly

- B. Connect piping in accordance with manufacturer's instructions

- C. Mechanical Joints

1. If an effective seal is not obtained, disassemble joint, clean thoroughly, and reassemble
2. Do not over-tighten bolts to compensate for poor installation
3. Carefully align holes in mechanical joints with restraint devices to permit installation of the harness bolts
4. Install flange and mechanical joint pieces so the four mechanical joint holes, as well as the flange holes, straddle the top centerline for horizontal piping, or the side centerline for vertical piping

- D. Push-on Joints

1. Lubricate joint surfaces immediately before completing the joint
2. Bevel spigot ends of field cut piping
3. Groove spigot ends of field cut restrained joint piping

- E. Flanged Joints

1. Take care when bolting flanges to insure that there is no restraint on the opposite end of the pipe which would prevent gasket compression or cause unnecessary stress in flanges
2. Leave one flange free to move in any direction while tightening flange bolts
3. Do not pack or assemble bell and spigot joints until all flanges affected thereby have been tightened
4. Tighten bolts gradually at a uniform rate to compress gaskets uniformly
5. Take special care in connecting to pumping equipment to insure no stresses are transmitted to pump flanges by connecting piping
 - a. Permanently support piping for accurate matching of bolt holes and uniform contact over the entire face of abutting pump and pipe flanges are obtained before bolting those flanges
 - b. Allow pump connection piping to move parallel to its longitudinal centerline while bolts are tightened
 - c. Level, align, and wedge pumps into position to fit connecting piping but do not install grout until after initial pipe fitting and alignment to allow shifting the pump on its foundation
 - d. Grout pumps prior to final bolting of connecting piping

- F. Mechanical Couplings

1. Cut pipe ends clean and smooth
2. Leave a space of 1/4 inch to 1 inch between pipe ends

G. Pipe Restraining Methods

1. In interior locations and where subject to internal pressure, bloc, anchor or harness piping with mechanically coupled, push-on or similar joints to prevent separation of joints
2. In buried piping provide concrete thrust blocking to prevent pipe movement caused by internal pressure at
 - a. bends deflecting 11-1/4 degrees or more
 - b. other locations show on Drawings
3. Concrete thrust blocking shall provide
 - a. bearing area as indicated on the Drawings
 - b. provide bond break
 - c. extend from fitting to solid undisturbed earth
 - d. installed so joints are accessible for repair

3.5 CONCRETE ENCASEMENT

- A. Provide as indicated on the Drawings
- B. Provide reinforcing as indicated on the Drawings
- C. Suitably support and block pipe and anchor against flotation

3.6 PROTECTIVE COATING

- A. Provide polyethylene tube encasement on all buried ductile iron pipe, fittings, valves and rodding
 1. Comply with AWWA C105
 2. As detailed on the Drawings
- B. Metal Surfaces
 1. Coat all steel clamps, rods, bolts, and other metal accessories used including pipe fittings and bolts in polyethylene tube encasement
 2. Apply 2 coats of coal tar paint to clean, dry metal surfaces
 3. Allow the first coat to dry and harden before applying the second coat

3.7 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/4 inch per foot, two percent minimum but never less than 1/8 inch per foot. Maintain gradients

3.8 FIELD QUALITY CONTROL

- A. Test each line at the Contractor's expense in the presence and to the satisfaction of the Engineer

- B. Provide all necessary pumping equipment, piping connections, pressure gauges with maximum of 5 psi increments, and other required equipment, facilities, and materials
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner
- D. Hydrostatic Test Conditions

<u>Service</u>	<u>Test Pressure</u>	<u>Test Medium</u>
Project Piping	150 psi	Water

- E. Procedure
 - 1. Plug or cap ends as required
 - 2. Bleed system to eliminate all air from system
 - 3. No testing before concrete thrust blocks have adequate curing time, 7 days minimum
 - 4. Notify Engineer 48 hours prior to testing
 - 5. Test for 2 hours with no more than 5 psi loss in pressure
 - 6. Leakage is the quantity of water added to a test section to maintain test pressure \pm 5 psi
 - a.
$$L = \frac{S \times D \times (P)^{0.5}}{133,200}$$
 - L = allowable leakage, in gallons per hour
 - S = length of pipe tested, in feet
 - D = nominal diameter of the pipe, in inches
 - P = avg. test pressure during the test, in psi (gauge)
 - b. All visible leaks shall be stopped to the satisfaction of the Engineer
 - c. All water used for pressure testing must be potable and delivered in acceptable containers
 - 7. Immediately locate and replace all pipe fittings, valves, pipe joints, and other materials found to be defective with new and acceptable material
- F. Owner will provide only water for initial filling and testing of pipeline
- G. Contractor will provide water for additional testing in accordance with Town of Windsor rules, regulations and pricing structures.

END OF SECTION