Appendix D: Technical Specifications

SECTION 01 00 00

BASIC REQUIREMENTS

PART 1 GENERAL

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1.2 CONTRACT DESCRIPTION

A. Work of the Project includes replacement of approximately 14,000 linear feet of 6-inch waterline replacement along Naranjo Creek Road. The project includes installation of two anticipated mainline pressure reducing valves.

B. Perform Work of Contract under a stipulated price basis with Owner in accordance with Conditions of Contract.

1.3 SPECIAL CONSIDERATIONS

A. Contractor is responsible for restoring the site to original or better condition at the Contractor's expense. Site restoration including temporary erosion control provisions is a prerequisite for periodic and final payment.

B. Should nesting of a species protected under the Migratory Bird Treaty Act be identified in the construction zone, construction will be limited to a time of year outside the general migratory bird nesting season of March through August, avoided until nesting is complete, or the nest will be relocated by a properly trained and authorized expert.

C. The allowable length of trench left open overnight is limited per Section 31 23 17 - Trenching. Contractor shall abide by all specified requirements included therein either directly or by reference.

D. Contractor will be responsible for re-grading the existing road anywhere it is disturbed, as well as regrading all driveways and roads intersecting Naranjo Creek Road that are disturbed.

E. Contractor must provide water for construction at the Contractor's expense. The Owner has indicated that water can be made available for purchase.

F. Contractor shall submit a Testing and Disinfection schedule to the Engineer for approval prior to performing the respective activities. Hydrostatic testing of the waterline, disinfection and bacteriological testing shall follow specifications outlined in Section 33 11 00 Water Utility Distribution Piping, 33 13 00 Disinfection of Water Distribution, AWWA C600, AWWA C605, AWWA C651 and New Mexico Standard Specifications for Public Works Construction.

G. Prior to beginning construction activities, the Contractor must furnish full-coverage video documentation of the entire construction site, per SC-2.05.B of the EJCDC C-800 Supplementary Conditions. The video must include coverage of all areas and adjacent features that may potentially be impacted by the impending construction work. Contractor must submit two (2) copies of the video documentation on DVD format as part of the submittal process.

H. As per the ADA Standards for Accessible Design, published by the U.S. Department of Justice (28 CFR Part 36 - Appendix A), all areas of newly designed or newly constructed buildings and facilities, and altered portions of existing buildings and facilities required to be accessible shall comply with the ADA Standards, unless otherwise provided or as modified in a special application section.

I. Contractor shall prepare record drawing information under the direction of a Licensed Professional Surveyor. Refer to Article 1.51 Project Record Documents below and General Notes on the Drawings for specific requirements related to As-Built Drawings.

J. Contractor shall coordinate with Owner for tie-in to existing infrastructure. Contractor shall notify Engineer prior to performing the respective activities.

K. Contractor must maintain a full set of Drawings and Technical Specifications at the construction site at all times throughout the construction process. All subcontractors must possess at least all Drawings and Technical Specifications pertaining to their portion of the work while on the construction site at all times.

L. Contractor shall be responsible for notifying residents of construction. Access to driveways must be maintained at all times.

M. Part of the new waterline installation will include connections to existing Asbestos-Cement (AC) Pipe. Unexpected or unavoidable breaks into the existing AC pipe are also possible. Contractor shall comply with all applicable Federal, State, Local, EPA, OSHA, NMED and

New Mexico Department of Transportation regulations pertaining to exposure, handling, containment, transport, and disposal of asbestos material. If Contractor is not licensed in the State of New Mexico to perform these services, Contractor shall retain the services of a licensed Asbestos Abatement sub-contractor to perform these services as required by the regulations. Further, the Contractor/sub-contractor must utilize the services of a commercial hauler that is registered with the New Mexico Environmental Department to transport asbestos as required by the regulations. The Contractor/sub-contractor must dispose of any asbestos waste material generated at a solid waste facility authorized for asbestos waste disposal. Contractor, per OSHA requirements, must train field personnel in the identification of asbestos containing material.

1. Contractor must submit the following items prior to construction:
    a. A work plan describing work procedures, equipment to be used, transportation procedures and final disposal facility for asbestos material.
    b. A health and safety plan which includes air-monitoring procedures as required by OSHA.
    c. Name and license number of the Asbestos-Abatement contractor that will be responsible for the work described above, or provide documentation that a specially licensed contractor is not required. If a specially licensed contractor is required, Contractor shall submit:
        1. References (including the owner's name, address and phone number) for at least five comparable projects performed by the Asbestos-Abatement contactor.

N. Construction work will generally not be permitted on the following Federal-recognized holidays: New Year's Day, Martin Luther King, Jr.'s Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, and Christmas Day. When any of the above holidays fall on a Saturday and the preceding Friday is established as a holiday for Government employees, or when any of the above holidays fall on a Sunday and the Monday following that day is established as a holiday for Government employees, no construction will be permitted on those days. However, the Owner, when in his/her opinion it is justified, may grant the Contractor permission to work on any of the above days upon advance written request by the Contractor.

O. Upon completion of the Work, ground surfaces will be restored to their original condition by grading, and seeding with native plant species.

P. In the event the Contractor encounters items of historical importance, the Engineer and the Owner shall be notified immediately and the work in the area shall immediately cease. Activity will cease until the Owner has consulted the Resident Project Representative and informed the Contractor of any steps to be taken or told to proceed with construction.

Q. Contractor shall confine operations to the construction site. Contractor shall be responsible for obtaining permission for any activity outside of the established and approved construction areas.

R. Contractor shall propose and get approval from Owner of an area to store construction debris including unsuitable material from site grading and/or excavation where it will not be a nuisance. All debris shall be contained in such a manner that will prevent scattering. All debris, including trees and undergrowth, shall be disposed of properly within a properly

permitted landfill. All debris shall be removed from the site prior to substantial completion. The handling, storage, and disposal of debris is incidental to the project.

S. Contractor shall implement the necessary site erosion control devices for inhibiting dust, wind, and air sediment movement offsite throughout construction in accordance with NPDES Best Management Practices and in accordance with the project SWPPP, if applicable.

1.4 WORK BY OWNER

A. Not Applicable.

1.5 CONTRACTOR'S USE OF PREMISES

A. No work shall be done before 7:00 A.M. or after 7:00 P.M., local time on a working day, on Sundays, or on legal holidays, except as necessary for the proper care and protection of work already performed, or during emergencies. For work on Saturdays, Contractor must request permission from the Engineer at least a week in advance.

B. The Contractor shall make every effort to minimize noise caused by his operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise.

C. The Contractor shall restrict his operations as nearly as possible to the immediate site. Unnecessary cutting of vegetation adjacent to the site is prohibited. Every effort shall be made to minimize erosion during and after construction and the site shall be returned to its original condition, except where improvements are indicated or required.

D. The Contractor shall take affirmative action to prevent the misuse of the natural environment, wasting of natural resources, or destruction of natural values.

E. The Contractor shall conform to all requirements set forth in the latest edition of the New Mexico Standard Specifications for Public Works Construction with latest revision, and Occupational Safety and Health Administration Regulations for trenching, shoring and excavation, and all other activities where such regulations apply. The Contractor and all subcontractors shall conduct all activities in conformance with federal and state laws and regulations relating to occupational health and safety. Authorized inspectors from NMED's Occupational Health and Safety Bureau shall have unobstructed access to project sites and shall not be impeded in any way from performance of their duties.

1.6 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

B. The Contractor shall furnish all materials, labor, plant and equipment necessary to complete the contract work as called for by the Technical Specifications and as indicated on the Drawings. Material and work, either expressed or implied, necessary for the

satisfactory completion of the contract work shall be considered an integral part thereof.

C. All standards incorporated herein by reference shall be the latest edition, unless otherwise specified. The abbreviations and applicable standards are described below:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CID	Construction Industries Division of the NM Regulation and Licensing Department
EJCDC	Engineers Joint Contract Documents Committee
EPA	Environmental Protection Agency
IBC	International Building Code
ISO	International Organization for Standardization
MSJC	Masonry Standards Joint Committee
NACE	National Association of Corrosion Engineers
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Department of Environment
NMSSPWC	New Mexico Standard Specifications for Public Works Construction
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
SAE	Society of Automotive Engineers
SSPC	Steel Structure Painting Council
UL	Underwriters Laboratories, Inc.

1.7 MINIMUM WAGE RATE DETERMINATION

A. Article 13-4-11, NMSA, 1978, requires that prevailing local wages be determined by labor category, and that this prevailing wage be the minimum acceptable pay rate. The Public Works Minimum Wage Act covers all public works construction, alteration, demolition, or repair projects when the project cost is $60,000 or more, and when the state or any political subdivision is a party. The wage rate determination provided by the New Mexico Department of Workforce Solutions for the present project can be found in an appendix to the Contract Documents.

B. The Contractor warrants and agrees that he and all subcontractors shall comply with all applicable provisions of the New Mexico Public Works Minimum Wage Act and other statutes pertaining to public works in New Mexico; and the Federal Wage Rate Determination. The Minimum Wage Rate Determinations can be found in an appendix to the Contract Documents.

C. Applicable federal and state regulations require that the higher of the federal or the state wage rate for each classification must be paid.

1.8 TESTING AND INSPECTION ALLOWANCES

A. Testing Allowance: The bid schedule includes a predetermined sum to cover the cost of testing and inspection services as required in the Contract Documents.

B. Contractor shall submit details regarding the proposed testing laboratory or inspection firm, including a statement of qualifications and a proposed schedule of unit price costs and estimated total cost for testing and inspection to be completed under the allowance. Any additional costs, such as travel time, shall also be detailed for this project on a unit price basis and as part of the estimated total cost of testing and inspection. Engineer may require the Contractor to solicit additional quotes if the proposed costs are not competitive.

C. Costs Included in Allowance: Cost of engaging testing or inspection firm, execution of tests or inspection, and reporting of results.

D. Costs Not Included in Allowance:
1. Incidental labor and facilities required to assist testing or inspection firm.
2. Cost of disinfection of waterlines, if applicable.
3. Costs of hydrostatic pressure testing or testing of material welds as called for in the Contract Documents.
4. Costs of failed tests.

E. Costs will be drawn from testing allowance and paid based on invoice(s) submitted to Contractor by testing or inspection firm(s), and reimbursed at cost, with no markup by Contractor. Contractor shall submit appropriate NTTC form to testing firm to assure tax is not included on invoices.

1.9 SCHEDULE OF VALUES

A. Submit schedule of values on the Construction Progress sheet within the Application for Payment forms provided in the Construction Contract Documents, or on other form acceptable to the Engineer. Contractor's standard form or electronic media printout will be considered.

B. Base structure of Schedule of Values on Bid Schedule with identical item numbering, quantities, and values.

C. Submit Schedule of Values in duplicate at least 15 days prior to first Progress Meeting.

1.10 APPLICATIONS FOR PAYMENT

A. Application for Payment is synonymous with Partial Payment Estimate.

B. Submit four [4] copies of each application on the Partial Payment Estimate form provided in the Contract Documents, together with updated Schedule of Values identifying fully the list of items in the Application for Payment.

C. The Partial Payment Estimate forms consist of four sections: Cover Sheet, Construction Progress spreadsheet, Materials-On-Hand form, and Monthly Construction Progress Certificate. The purpose of the Monthly Construction Progress Certificate is to provide a complete account of all change orders/claims for the corresponding contract period, and all outstanding change orders/claims from previous contract periods, and waives any rights to

further adjustments in contract times or price for any change orders/claims that originated in the current contract period.

D. Payment Period: Monthly, however the present Contract allows the Owner to make payment within forty-five days after submission of an undisputed request for payment.

1.11 CHANGE PROCEDURES

A. All Change Orders shall be prepared on the form provided in these Contract Documents.

B. Unit Price Change Order: For pre-determined unit prices and quantities, Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work not pre-determined, refer to Article 12 - Change of Contract Price; Change of Contract Times, of the Standard General Conditions (EJCDC C-700 Standard General Conditions of the Construction Contract).

1.12 UNIT PRICES

A. Engineer will take measurements and compute quantities accordingly. The Contractor will assist in taking of measurements and determination of work completed prior to preparation of corresponding Application for Payment.

1.13 ALTERNATES

A. Not applicable.

1.14 COORDINATION

A. Obtain any required business license(s) required by Owner or agency(ies) with jurisdiction prior to commencing construction activities.

B. Coordinate scheduling, submittals, and Work of various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

C. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

D. Submit a Traffic Control Plan that is signed and sealed by a Professional Engineer in the state of project location prior to construction activities.
1. All existing signs, markers, delineators, etc. within the construction limits shall be removed, stored, and reset.
2. Subject to the established Traffic Control Plan, at least one lane shall be open to traffic at all times. Provide proper signage to maintain the traffic lane in such a manner as to assure proper safety to the traveling public on all affected roads. Provide access to all private and public property at all times except when grading, excavation and backfill operations are being conducted immediately in front of the property, in which case access will not be denied for more than 4 hours without approval from the Engineer.

3. Traffic lanes provided during construction shall be maintained in such a condition under all weather conditions, so as to permit the reasonable passage of passenger vehicles, and shall be kept graded and smooth and watered several times daily, as needed, to control dust.

E. Obtain all applicable permits from the NMDOT before boring under any roadways or working along or across NMDOT rights-of-way, unless the permits have already been obtained by the Engineer. The Contractor is also responsible for obtaining all applicable local, county and state building and development permits not previously obtained by Engineer or Owner. This includes permits from the Construction Industries Division of the Regulation and Licensing Department of the State of New Mexico, and any other regulatory agency having jurisdiction.

F. Contractor is responsible for timely scheduling of any pertinent inspections with local, county and state agencies with jurisdiction, and as required by the permits.

G. Coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

H. All notices, demands, requests, instructions, approvals, proposals and claims must be in writing.
1. Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement.
2. All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the Owner at the address stated on the signature page of the Agreement.
3. Any such notice shall be deemed to have been given as of the time of actual delivery, in the case of mailing, when the same should have been received in due course of post, or in the case of telegrams, certified mail, or telephone facsimiles, at the time of actual receipt as the case may be.

1.15 SUSPENSION OF WORK

A. The Owner may order suspension of work due to seasonal or other conditions unsuitable for construction work.

B. Maintenance during suspension: Prior to suspension for any cause, the Contractor shall take necessary precautions to protect the work during the period of suspension from any factors which would contribute to its deterioration.

C. Time elapsed during suspension of the work shall not count as contract time. The Contractor shall make no claim for damages due to delay, additional mobilization charges, nor any additional costs that may be incurred solely due to suspension of work.

D. Requests for additional time to be added after the “contract completion date” due to delays or extra work shall be made to the Owner in writing by the Contractor within ten (10) days

after the time of the occurrence of the delay or receipt of a Change Order for extra work. Such requests shall set forth the justification for the additional time.

E. Upon approval, the additional contract time shall then be in full force and effect, the same as though it were the original date for completion, and will be shown as the completion date plus an amount of additional working days. Any time required to complete the work beyond the contract time or additional contract time will result in the assessment of liquidated damages, as specified in the Contract Documents. Failure to make such requests within the above limits will be considered as a waiver on the part of the Contractor as to the need for additional contract time.

1.16 FIELD ENGINEERING

A. Establish elevations, lines, and levels and certify and confirm elevations and locations of the Work, conforming with the Contract Documents, with the Engineer prior to performing any excavation.

B. Verify field measurements are as indicated on shop drawings or as instructed by manufacturer.

C. From the information provided by the Owner, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, easement alignments, stakes for pipe locations and other working points, lines, elevations and cut sheets.

1.17 PRE-CONSTRUCTION CONFERENCE

A. Engineer will schedule Pre-Construction Conference after Notice of Award for affected parties.

B. The Contractor, or his duly authorized representative, and subcontractor representatives will attend the meeting.

1.18 PROGRESS MEETINGS

A. Schedule in coordination with the Engineer at maximum monthly intervals, and attend all Progress Meetings throughout progress of the Work.

B. The purpose of the meetings will be to review the following:
1. Work progress since previous meetings.
2. Field observations, problems, conflicts.
3. Problems which impede construction schedule.
4. Corrective measures and procedures to regain projected schedule.
5. Revisions to construction schedule.
6. Plan progress and schedule during succeeding work period.
7. Coordination of schedules.
8. Off-site fabrication and delivery schedules.
9. Maintenance of quality standards.

10. Proposed changes, construction schedule and completion date.
11. Coordination of separate contracts.
12. Record or “as-built” drawings of completed work.
13. Other business as required.
14. Regulatory requirements including OSHA, New Mexico Board of Labor, and others as applicable.
15. Funding requirements including RUS, NMED, NMFA, DFA, USEPA and others as applicable.

C. During each meeting, the Contractor is required to present any issues which may impact his Work, with a plan to resolve these issues expeditiously.

D. Together with each payment application, Contractor must present the current as-built drawings reflecting all work performed to date.

1.19 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

B. Execute cutting, fitting, and patching, including excavation and fill, to complete Work, and to:
1. Uncover Work to install or correct ill-timed Work.
2. Remove and replace defective and non-conforming Work.
3. Remove samples of installed Work for testing.
4. Provide openings in elements of Work for penetration of mechanical and electrical Work.

C. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

D. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

E. Refinish surfaces to match adjacent finishes.

1.20 SUBMITTAL PROCEDURES

A. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions and elevations, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

C. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of completed Work.

D. Revise and resubmit submittals as required by the Engineer; identify changes made since previous submittal.

E. Submit number of copies Contractor requires, plus two copies Engineer will retain, at a minimum, unless otherwise indicated at the Pre-Construction Conference.

F. Transmit each submittal with Engineer accepted form.

G. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

H. Prior to commencing construction activities, Contractor shall provide two (2) copies of the corresponding Project safety plan to the Engineer, per SC-7.12.I of EJCDC C-800 Supplementary Conditions.

1.21 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within fifteen [15] days after date of Owner-Contractor Agreement for Engineer review.

B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

E. Indicate delivery dates for Owner furnished products and products identified under Allowances.

1.22 PROPOSED PRODUCTS LIST

A. Unless required as an attachment to Bid, within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.23 PRODUCT DATA

A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit copies and distribute in accordance with Submittal Procedures article.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.24 SHOP DRAWINGS

A. Shop Drawings:
1. Submitted to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
2. Include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, list, graphs, catalog sheets, data sheets, and similar items.
3. Design calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the project is to be built, unless otherwise directed.
4. After review, provide copies and distribute in accordance with Submittal Procedures article and for record documents purposes as specified.
5. Except as may otherwise be indicated herein, the Engineer will return copies of each submittal to the Contractor with comments noted thereon, within 30 calendar days following their receipt by the Engineer.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Submit number of opaque reproductions Contractor requires, plus two copies Engineer will retain.

1.25 TEST REPORTS

A. Submit for Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.26 MANUFACTURER'S INSTRUCTIONS AND CERTIFICATES

A. When specified in individual specification sections, submit manufacturer printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. When specified in individual specifications sections, submit certifications by manufacturer to Engineer, in quantities specified for Product Data.

D. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

E. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.27 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturer's instructions.

C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.28 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed products over suppliers, manufacturers, products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturer's tolerances.

1.29 REFERENCES

A. Conform to reference standards by date of issue current as of date of Contract Documents.

B. When specified reference standard conflict with Contract Documents, request clarification from Engineer before proceeding.

1.30 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or product suppliers or manufacturers to furnish qualified staff personnel to observe site conditions and to initiate instructions when necessary.

B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturer's written instructions.

1.31 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify utility services are available, of correct characteristics, and in correct location.

C. Contractor is solely responsible for utility location, protection and verification. Contractor must notify New Mexico One Call System Inc., at 811, and all local utility providers, three (3) days before starting utility line construction.

D. It shall be the responsibility of the Contractor to become acquainted with the location of all underground structures which may be encountered or which may affect the Work hereunder.

1.32 TEMPORARY SERVICES

A. Provide, maintain and pay for suitable quality water service as required.

B. Maintain uninterrupted water, wastewater, and electric service to all properties adjoining the Work, except where specifically approved by the authority having jurisdiction. Services damaged by the Contractor shall be immediately and permanently repaired or replaced at the expense of the Contractor. Give a minimum of 48-hour advance notice to occupants of adjacent properties before interrupting any service. Any interruption of service shall be kept to the minimum length of time possible.

C. Until final inspection and approval of the Work and issuance of the Certificate of Substantial Completion, the Contractor is responsible for all Work directly or indirectly affected by the Contractor's activities. Such responsibility continues for all Work detailed on the punch list that may accompany the Certificate of Substantial Completion, until satisfactorily completed by the Contractor and approved by the Owner and Engineer.

D. Furnish, install and maintain any temporary water storage structures, electrical connections, meters, wiring, outlets, switches, lamps, etc., as necessary for the work. The Contractor shall provide such temporary heat as may be necessary for the prevention of injury to the work or material through dampness or cold. All temporary connections, installations, facilities and supplies furnished or installed as specified in this paragraph, shall be removed prior to the completion of the Contract, and the premises left perfectly clean and satisfactory to the Owner.

E. Maintain ambient temperature above freezing in enclosed/occupied areas where construction is in progress, unless indicated otherwise in specifications.

F. Provide temporary electricity and power outlets for construction operations, connections, branch wiring, distribution boxes, and flexible power cords as required. Do not disrupt Owner's need for continuous service.

G. Provide and maintain required sanitary facilities and enclosures in clean and sanitary condition.

1.33 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Existing on-site roads, designated by the Owner, may be used for construction traffic.

1.34 PROGRESS CLEANING AND WASTE REMOVAL

A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove waste and surplus materials, rubbish, and construction facilities from site. Restore all job sites and adjoining areas, including roads and driveways, to a condition equal to or better than the original status. Special attention will be made to not disturb unimproved roads by placing any excavated material to the sides of these roads when waterlines are located along the right-of-way.

C. Brush and trees shall be felled parallel to the right-of-way to minimize damage to trees and structures on adjacent property. All brush, tree tops, stumps and other debris shall be removed from the right-of-way and disposed of by the Contractor, subject to and in conformity with the special provisions applying to the tract of land involved (if any). The Contractor shall not destroy nor remove any trees, shrubbery, nor any other improvements, without permission of the Owner.

D. The Contractor shall not dispose of debris, refuse or sanitary wastes in an open dump or in a natural watercourse, whether on public or private property, or in such places that undesirable wastes can eventually be exposed or carried to a natural watercourse.

1.35 BARRIERS AND FENCING

A. Provide barriers or fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.

1.36 PROTECTION OF INSTALLED WORK

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

1.37 SECURITY

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

1.38 WATER CONTROL

A. Provide erosion control.

B. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. In the event that one acre of earth or more is disturbed, the Contractor shall submit to the Owner's Resident Project Representative a Storm Water Pollution Prevention Plan (SWPPP) that will address all construction phases and the proposed pollution prevention and sediment control measures. This shall be done in accordance with the National Pollution Discharge Elimination System (NPDES) general permit requirements for all construction activities, and shall include all required reporting. If the Bid Form does not include an item for preparation and implementation of the SWPPP, the cost thereof will be considered incidental to related work.

D. The Contractor shall conduct his operations to minimize damage to natural watercourses, and shall not permit petroleum products, volatile fluid wastes, or any other wastes which are prohibited by local ordinances, or excessive amounts of silt, clay, or mud to enter any drainage system. The bed of natural watercourses or man-made irrigation ditches shall be restored to normal gradient and cross-section after being disturbed.

1.39 POLLUTION AND ENVIRONMENTAL CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Provide dust control, erosion and sediment control, noise control, pest control and rodent control to allow for proper execution of the Work. Short term effects of dust produced by equipment will be mitigated by sprinkling traffic areas with water. Motor equipment shall be kept in repair and equipped with anti-pollution devices, if possible, to cut down on exhaust emissions. Burning as a method of cleaning or disposal will not be permitted without approval of the proper authorities.

C. Comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act of 1970 (42 U.S.C. 1251 et seq.) as amended. Violations shall be reported to the New Mexico Environment Department.

D. The Contractor shall be responsible for the reporting and the cleanup of spills associated with project construction and shall report and respond to spills of hazardous materials such as gasoline, diesel, motor oil, solvents, chemicals, toxic and corrosive substances, and other materials which may be a threat to the public health or the environment. The Contractor shall be responsible for reporting past spills encountered during construction and of current spills not associated with construction. Reports shall be made to the New Mexico Environment Department Emergency Response Team at (505) 476-6025 during business hours. If there is no emergency situation the Contractor can leave a message regarding the nature of the spill, location and contact information. For emergencies that require immediate attention and mitigation, and there is no response at the NMED Emergency Response Team number above, call (505) 827-9329. For emergencies that pose immediate danger to public health or property, call 911. For any and all spills, Contractor shall also immediately contact the Owner's Resident Project Representative.

E. The Contractor shall clean up any unreported spills associated with project construction identified after construction.

1.40 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion review.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.41 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Provide interchangeable components of same manufacturer for components being replaced.

1.42 DELIVERY, HANDLING, STORAGE, AND PROTECTION

A. Deliver, handle, store, and protect Products in accordance with manufacturer's instructions.

1.43 SUBSTITUTIONS

A. Substitutions will only be considered when Product becomes unavailable through no fault of Contractor, or where an “approved equal” is specifically allowed elsewhere in the Technical Specifications or noted on the Drawings. In such cases, the brand name and/or model number of products that have been identified in these Specifications serve as the basis of the design. These products may be substituted with other products that meet the same manufacturing standards, quality, performance and desired characteristics of the Specifications when approved by the Engineer or Owner’s representative.

B. Specific manufacturers may be required for certain items in order to maintain consistency with the Owner’s existing inventory. In such cases, substitutions will not be allowed as indicated in each specification section where applicable.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. Submit three [3] copies of request for Substitution to the Engineer for consideration. Limit each request to one proposed Substitution.

1.44 CLOSEOUT PROCEDURES

A. Submit written certification Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and amount remaining due.

C. Among required closeout submittals include: Release of Liens, Consent of Surety, and Certification of Labor Standards.

1.45 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Upon completion of the work under this contract, thoroughly clean and make any needed repairs caused by damage during construction to any existing utilities or other structures on the site.

C. Notify the Engineer in writing once final cleaning is complete. The final estimate will not be prepared until the Contractor has complied with all requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that it is properly constructed and the site properly cleaned.

1.46 STARTING OF SYSTEMS

A. Provide seven [7] days notification prior to start-up of each item.

B. Ensure each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturer’s instructions.

D. Submit written report stating equipment or system has been properly installed and is functioning correctly.

1.47 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six [6] months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

1.48 TESTING, ADJUSTING, AND BALANCING

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

B. Owner retains the right to appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing. Reports will be submitted by independent firm to Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with requirements of Contract Documents.

C. Contractor will cooperate with independent firm; furnish assistance as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to Contractor.

1.49 PROTECTING INSTALLED CONSTRUCTION

A. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

B. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

C. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

D. Prohibit traffic from landscaped areas.

1.50 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed.

D. Record Documents and Shop Drawings (As-Built Drawings): Legibly mark each item to record actual construction. Deliver two (2) sets of As-Built Drawings with redlines to the Owner upon completion of the Project. The As-Built Drawings will be submitted to the Engineer prior to processing of final payment to the Contractor.

E. The Contractor shall also submit electronic survey information of the actual placement of lines and appurtenances. including elevations at top of pipe, northing and easting of top of pipeline or new utility at intervals not to exceed 100 feet and at all fittings, valves and transitions and other appurtenances as well as finished grade elevations at each location cited above, and at the top of flange or top of nut (specify on drawing point description) of all hydrants. Submittals to be a combination of electronic survey point files with copies of

survey field book information and/or electronic CAD drawing files including relevant survey point file and field book information. All survey information and electronic CAD drawings to be tied to established survey control as provided on plan set survey control sheet.

F. Submit documents to Engineer together with claim for final Application for Payment.

1.51 OPERATION AND MAINTENANCE DATA

A. Submit 3 sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide binder contents with permanent page dividers, logically organized.

D. Contents:
1. Part 1: Directory
   a. List names, addresses, and telephone numbers of Engineer, Contractor, subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system:
   a. Equipment summary, operational procedures, preventive maintenance procedures and schedules, parts list, shop drawings, safety issues.
3. Part 3: Project documents and certificates.
   a. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

1.52 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to project site and place in location as directed by Engineer; obtain receipt prior to final payment.

1.53 WARRANTIES AND PRODUCT REGISTRATION

A. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers for all products with extended warranties beyond one (1) year.

B. Execute and assemble product registration documents from suppliers and manufacturers, on Owner’s behalf, for all products requiring such registration, for recall or warranty purposes.

C. Submit prior to final Application for Payment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03 05 00

BASIC CONCRETE MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes formwork, reinforcement, accessories, cast-in-place concrete, transporting, placing, finishing, curing, and other pertinent items of construction.

B. Concrete and Standards - Except as noted or modified in this section, all concrete materials, transporting, placing, finishing, curing, and sealing shall conform to requirements as follows:

1. American Institute of Concrete (ACI)
   a. 301 - Specifications for Structural Concrete.
   b. 302.1R - Guide to Concrete Floor and Slab Construction.
   c. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
   d. 305.1 - Specification for Hot Weather Concreting.
   e. 306.1 - Standard Specification for Cold Weather Concreting.
   f. 308.1 - Standard Specification for Curing Concrete.
   g. 318 - Building Code Requirements for Structural Concrete.
   h. 347R - Guide to Formwork for Concrete.
   i. SP-66 - ACI Detailing Manual.
2. ASTM International (ASTM)
   a. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   b. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   c. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   d. ASTM C33 - Specifications for Concrete Aggregates.
   e. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   f. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
   g. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   h. ASTM C94 - Specification for Ready-Mixed Concrete.
   i. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
   j. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
   k. ASTM C150 - Standard Specification for Portland Cement.
   l. ASTM C156 - Standard Test Method for Water Loss [from a Mortar Specimen] Through Liquid Membrane-Forming Curing Compounds for Concrete.
   m. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

n. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
o. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
p. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
q. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
r. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
s. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
t. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
u. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
v. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
w. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
x. ASTM C1550 - Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel).
y. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
z. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
aa. ASTM C1609 - Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading).
bb. ASTM C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.

3. American Association of State Highway & Transportation Officials (AASHTO):
   a. PP 65 - Standard Practice for Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction.

1.2 QUALITY ASSURANCE

A. Inform Engineer at least 48 hours in advance of time at which Contractor intends to place concrete.

B. When required by any applicable permits, such as CID permits, Contractor shall have reinforcement inspected by the agency with jurisdiction prior to placement of concrete.

C. Construct and erect concrete formwork in accordance with ACI 301 and ACI 347R.

D. Concrete tests shall be in accordance with requirements of ACI 301, except as noted or modified in this Section.
1. Strength test:

a. Mold and cure 5 cylinders from each sample.
b. Test one at 7 days and one at 14 days for information and two at 28 days for acceptance.

E. Samples:
1. Collect the following minimum samples for each 28-day strength concrete used in the work for each days placing:

Quantity	Number of Samples
50 cubic yards or less	1
50 to 100 cubic yards	2
100 cubic yards or more	2 plus 1 sample for each additional 100 cubic yards

2. Sampling should be in accordance with ASTM C172.
3. Forming cylinders in accordance with ASTM C31.
4. No sample shall be required for thrust blocks nor fence posts.
5. Hold fifth cylinder for future considerations. Deliver to Owner upon determination of substantial completion and prior to final payment.
6. Sample marking.
   a. Mark or tag each sample of compression test cylinders with date and time of day cylinders were made.
   b. Identify location in work where concrete represented by cylinders was placed.
   c. Identify delivery truck or batch number, air content and slump.
7. Slump test:
   a. Conduct test for each strength test sample and whenever consistency of concrete appears to vary, in accordance with ASTM C143.
8. Air content:
   a. Conduct test from 1 of first 3 batches mixed each day and for each strength test sample, in accordance with ASTM C231, 138 or 173.
9. Temperature:
   a. Conduct test in accordance with ASTM C1064.

F. Coordinate concrete placement with the Engineer to ensure proper testing in compliance with the Drawings and Specifications. The cost of all tests shall be covered by the Testing Allowance provided for in the bid schedule, except for failed tests, or new analyses required due to failed tests.

G. The Contractor is free to take additional specimens for his own information, at his own expense, not reimbursable from the Testing Allowance.

H. Acceptance of Concrete: Strength level of concrete will be considered satisfactory so long as average of all sets of 3 consecutive strength test results equal or exceeds specified 28-day strength and no individual strength test result falls below specified strength (***fc′***) by more than 500 psi when specified compressive strength is 5000 psi or less; or by more than **0.10*fc′*** when specified compressive strength is more than 5000 psi.

I. Failure of Test Cylinder Results: Upon failure of test cylinder results, Engineer may require Contractor, at his expense, to test remaining cylinder after curing for a period of

time specified by Engineer. If strength level of this cylinder is not greater than specified 28-day strength, Engineer may require Contractor to obtain and test at least three 2-inch diameter cored samples from an area in question.

1. Conform to ASTM C42.
2. Concrete will be considered adequate if average of 3 cores is at least 85 percent of, and if no single core is less than 75 percent of, specified 28-day strength.
3. Upon failure of core test results, Engineer may require Contractor, at his expense, to perform load tests as specified in ACI 318.
4. Fill all core holes as specified for repairing defective concrete.

J. Completed Work

1. Completed concrete work which fails to meet 1 or more requirements, but which has been repaired to bring it into compliance, will be accepted without qualification.
2. Completed concrete work which fails to meet 1 or more requirements and which cannot be brought into compliance shall be rejected as provided in these Contract Documents. In this event, modifications shall be required to assure that concrete work complies with requirements. Modifications, as directed by Engineer, to be made at no additional cost to Owner.

K. Perform concrete reinforcing and cast-in-place concrete work in accordance with ACI 301.

L. The maximum deviation of the top surface of curb and gutter shall not exceed 1/8" in 10' nor shall the inside face deviate more than 1/4" in 10' from a straight line. Prior to or during final inspection, curb and gutter shall be water flow tested as directed by the Engineer. All areas with standing water will be rejected.

M. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

PART 2 PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Steel Forms: Symons “Steel-Ply”, Simplex “Industrial Steel Frame Forms”, Universal “Uniform”. Forms shall be clean, straight and true, without surface defects.

B. Plywood Forms: Product standard PS-1, waterproof, resin-bonded exterior type Douglas Fir or Larch. Forms shall be clean, straight and true, without surface defects.

C. Lumber: Douglas Fir or Larch, straight, uniform width and thickness, clean and free from offsets, holes, dents and other surface defects.

D. Chamfer Strips: Clean white pine, surface against concrete planed.

E. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615, deformed. Reinforcement bar, size and spacing as indicated on the Drawings.

B. Welded wire fabric reinforcement shall conform to the requirements of ASTM A1064 and the details shown; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

C. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; plastic tipped or non-corroding for supports in slabs where supports are exposed to weather.

D. Concrete blocks used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

E. Fabricate concrete reinforcing in accordance with ACI SP-66.

2.3 CONCRETE MATERIALS

A. Cementitious Materials:
1. Portland Cement: ASTM C150 Type I.
2. Fly Ash: ASTM C618, Class F or C.
3. Slag Cement: ASTM C989, Grade 100 or 120.
4. Silica Fume: ASTM C1240.
5. Metakaolin: ASTM C618, Class N.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C1602/C1602M, Clean and not detrimental to concrete.

D. Chemical Admixtures (when applicable): Compatible with each other and free of intentionally-added chlorides.
1. Air Entraining Admixture: ASTM C260.
2. Water-Reducing Admixture: ASTM C494, Type A.
3. Mid-Range Water-Reducing Admixture: ASTM C494, Type A.
4. High-Range Water-Reducing Admixture: ASTM C494, Type F.
5. Accelerating Admixture: ASTM C494, Type C or E.
6. Retarding Admixture: ASTM C494, Type B or D.
7. Workability-Retaining Admixture: ASTM C 494, Type S.
   a. Shall retain concrete workability without affecting time of setting or early-age strength development.
8. Alkali-Silica Reaction Inhibiting Admixture: ASTM C494, Type S
   a. Shall contain a nominal lithium nitrate content of 30 percent.

2.4 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Re-tempering of prepared concrete will not be permitted.

C. Furnish concrete of the following strength:

Type of Work	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (in.)	Min. Cement W/C per CY (94# sacks)	Maximum w/cm (by wt.)
Slabs on grade, footings floor slabs, and all other concrete items not specified elsewhere.	4,000	1	6.0	0.50
Site work concrete such as fence posts, thrust blocks, valve collars, etc.	3,000	1	5.0	0.50

D. Proportioning:

1. Proportion ingredients to produce a well-graded mix of high-density maximum workability consistent with approved mix design.
2. Entrained air - all concrete exposed to freeze-thaw cycles under saturated conditions:
   a. Five (5) percent, plus or minus one (1) percent, for concrete in the forms. Concrete samples for air content tests shall be taken at the end of the concrete truck chute or the output of the concrete pump, whichever applies. A reduction in air content of pumped concrete should be expected. Contractor shall be responsible to coordinate with the concrete supplier to provide the specified air content of the in-place concrete.
   b. Refer to ACI 301 for further requirements.
3. Fly ash, silica fume, and slag cement:
   a. Fly ash: The mineral admixture Class F fly ash shall be proportioned by weight of cement to provide a fly ash to portland cement ratio not less than 1:4 and not less than 25 per cent of the total cementitious material. Portland cement concrete submitted under this specification shall be proportioned with Class F fly ash, unless a variance is authorized by the Engineer. Alternatively, lithium-based admixture can be used in lieu of Class F fly ash to mitigate ASR. The Contractor shall provide the Engineer with chemical and physical analysis of the fly ash.
   b. Silica fume: Silica fume may be added to the mix and shall be proportioned by weight of cement to provide a silica fume to Portland cement ratio not less than 1:25 and no greater than 1:7. Portland cement concrete using silica fume shall follow ASTM C1240 standards.
   c. Slag cement: Slag cement may be added to the mix and shall be proportioned by weight of cement to provide a slag cement to Portland cement ratio of no greater than 80 percent. Slag cement can consist of

Grade 100 or grade 120. Portland cement concrete using slag cement shall follow ASTM C989 standards.

4. Aggregates supplied under this Specification shall be assumed to be "alkali-silica reactive", ASR. Mitigation measures, such as the use of supplementary cementitious materials or lithium nitrate based admixtures or the combination of both, shall be utilized in the concrete mixtures to mitigate alkali-silica reaction, when the aggregates are known to be alkali-silica reactive. Replacement levels of supplementary cementitious materials and the dosage of lithium nitrate based admixtures shall be determined in accordance with the performance-based approach provided in ASTM C1778. Variance from this position for a particular aggregate source may be authorized by the Engineer. Application for a variance may be made to the Engineer.
   a. Portland cement concrete design mixes using non alkali-silica reactive aggregates will not be required to be proportioned with Class F fly ash.

E. Batching and Mixing Equipment: Conform to ACI 304R.

F. Slump:
1. Keep as low as possible consistent with proper handling and thorough compaction.
2. Shall not exceed 4 inches unless otherwise authorized by Engineer.

2.5 CEMENT GROUT

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.
2. Water content shall be such that the grout can be readily spread, yet not wet enough to cause trouble with surface water or laitance, or failure to stay in place after screeding. All grout mixes and mixing procedures shall be submitted in accordance with submittal requirements, and shall be subject to review and approval by the Engineer prior to commencing the grouting operations.

E. The minimum compressive strength at 28 days shall be 4000 psi.

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Erect formwork, shoring and bracing to achieve design requirements.

B. Erect forms substantially and sufficiently tight to prevent leakage of mortar and braced or tied to maintain desired position, shape and alignment before, during, and after concrete placement.

C. Carefully remove forms only after concrete is able to support all dead and live loads and curing requirements are met. Apply curing compound to all formed surfaces immediately after form removal.

D. Camber slabs and framing to achieve ACI 301 tolerances.

E. Provide bracing to ensure stability of formwork.

F. Clean forms as erection proceeds, to remove foreign matter.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

D. Install water stops continuous without displacing reinforcement.

3.3 REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

3.4 PLACING CONCRETE

A. Do not place concrete during rain, sleet, or snow unless adequate protection is provided and Construction Observer approval is obtained. Do not allow rainwater to increase mixing water or damage surface finish.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

C. Convey concrete from mixer to final position as rapidly as practicable without segregation or loss of material. Limit chute length to less than 20 feet with maximum slope of 1 vertical to 2 horizontal.

D. Maximum height of concrete free fall is 4 feet.

E. Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints.

F. On large volume pours, concrete shall be placed with the aid of approved mechanical vibrators. Vibration shall be supplemented by manual forking or spading adjacent to the forms on exposed faced in order to secure smooth dense surfaces. The concrete shall be thoroughly consolidated around reinforcement, pipes or other shapes built into the work.

G. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

H. Screed slabs-on-grade and concrete base for toppings level.

3.5 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Remove formwork progressively and in accordance with code requirements.

3.6 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.

B. Uniformly spread, screed, and float concrete.

C. In areas with floor drains, maintain floor level at walls and slope surfaces uniformly to drains.

D. Provide surface conforming to proper elevation and contour with all aggregates completely embedded in mortar by screening.

E. Provide an initial float as soon as concrete has stiffened sufficiently for proper working.

F. Provide a second floating at time of initial set.

G. Apply a broom finish.

3.7 CURING

A. Immediately after placement, protect concrete from premature drying.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete, for not less than ten (10) days in warm to hot weather (per ACI 305.1), and fourteen (14) days in cold weather (per ACI 306.1) after placing, unless otherwise indicated by the Engineer, in accordance with the methods specified herein for the different parts of the Work.

1. Cold weather is defined as when the temperature reaches or goes below 35 degrees F for one (1) hour during any 24-hour period during the curing period.

C. Use a pre-approved concrete curing method. Acceptable curing methods, as detailed in ACI 308.1, are as follows:
1. Water Curing Methods:
   a. Ponding/Immersion.
   b. Fogging/Sprinkler.
   c. Burlap/Cotton Mats/Absorbent Material.
   d. Wet Sand Curing.
   e. Straw/Hay.
   f. Plastic Film.
   g. Reinforced Paper.
2. Liquid Membrane-Forming Compounds.

D. The covering used, if applicable, must be overlapped adequately to ensure 100% coverage, and must not be allowed to become dry at any point during the curing period. Place and anchor covers, mats, and/or sheeting to ensure continuous contact with the concrete surfaces.

E. When using one of the water curing methods, keep the concrete structures thoroughly and continuously moist and covered during the entire curing period.

3.8 FIELD QUALITY CONTROL

A. Concrete Test Cylinders collected for each class of concrete placed each day.
1. 50 cubic yards or less – collect five (5) cylinders
2. 50 to 100 cubic yards – collect five (5) additional cylinders (10 total)
3. 100 cubic yards or more – in addition to the cylinders collected for the first 100 cubic yards of concrete placed, collect five (5) cylinders for every additional 100 cubic yards.

B. One (1) Additional Test Cylinder: Taken during cold weather concreting, and cured on job site under same conditions as concrete incorporated into the Work.

C. One (1) Slump Test: Taken for each set of test cylinders taken and whenever consistency of concrete appears to vary.

D. One (1) Air Content Test: Taken for each set of test cylinders taken.

E. One (1) Concrete Temperature Measurement: Taken for each set of test cylinders taken.

F. One (1) Ambient Air Temperature Measurement: Taken for each set of test cylinders taken and at the beginning of each day that concrete is being placed.

3.9 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Engineer.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and other obstructions.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

B. Related Sections:
1. Section 31 22 13 - Rough Grading.

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with the most recent edition of the New Mexico Standard Specifications for Public Works Construction, with latest revisions.

B. Perform Work in accordance with the most recent edition of the NMDOT Standard Specifications for Road and Bridge Construction, with latest revisions.

C. Conform to applicable State of New Mexico code for environmental requirements, disposal of debris, burning debris on site, use of herbicides.

D. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Quality Requirements: Examination of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area and/or salvage area for placing removed materials.

3.2 PREPARATION

A. Call New Mexico "One Call" at 811 and local utility companies at least three (3) days before performing Work.
   1. Request that underground utilities be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within indicated areas. Remove stumps and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, and other obstructions as indicated on Drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities as directed by Owner and/or Engineer. Indicate removal termination point for underground utilities on Record Documents.

D. Continuously clean up and remove waste materials from site. Do not allow materials to accumulate on site.

E. The Engineer will indicate to the Contractor which obstructions are to be removed, disposed of, or salvaged, and will require special documentation.

F. All existing fences crossed by the Work, or are within the construction area, are to be removed and rebuilt to original condition or better. Fence materials resulting from such removal are to be stored or disposed of as directed by the Engineer. Fence materials suitable for reuse or salvage that are damaged, lost or destroyed due to the Contractor's negligence or carelessness are to be replaced at the Contractor's expense.

G. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

E. All equipment shall be properly maintained and with proper safety devices.

F. Contractor must maintain control of dust and minimize blowing debris.

G. All equipment shall be operated as to not interfere with the operation of the landfill or patrons of the landfill.

H. All material excavated that is designated for use in the clay liner shall be stockpiled in clay stockpile area or in location designated by Engineer.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating subsoil.
2. Cutting, grading, filling, rough contouring, and compacting site for site structures and building pads.

B. Related Sections:
1. Section 31 10 00 - Site Clearing.
2. Section 31 23 17 – Trenching.
3. Section 31 23 23 – Backfill.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. The following payment concepts only apply when a corresponding item is included in the Bid Schedule. If no specific item is provided, then this work shall be considered incidental to those items which require grading.

B. Topsoil Fill:
1. Basis of Payment: Includes excavating existing soil, supplying soil materials, stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Subsoil Fill:
1. Basis of Payment: Includes excavating existing subsoil, supplying subsoil materials, stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Structural Fill:
1. Basis of Payment: Includes excavating existing subsoil, supplying structural fill materials, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.3 REFERENCES

A. Geotechnical Report
1. Geo-Test, Inc., “Regina MDWCA Naranjo Creek Waterline Replacement” June 27, 2023.

B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

C. American Society for Testing and Materials International (ASTM):
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft3.
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft3.
8. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.
9. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
10. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
11. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
12. ASTM D2434 - Standard Test Method for Permeability of Granular Soils Constant Head.
13. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
14. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
15. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
16. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.
17. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
18. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
19. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
20. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
21. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
22. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
23. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
24. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
25. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
26. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
27. ASTM D5080 - Rapid Determination of Percent Compaction.

28. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures.

B. Samples: Submit, in airtight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

B. Perform Work in accordance with applicable New Mexico State Standards.

PART 2 PRODUCTS

2.1 MATERIALS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Quality Requirements: Examination of existing conditions before starting work.

B. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call New Mexico “One Call” at 811 and local utility companies at least three (3) days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect remaining utilities from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

G. Notify Owner of any utility damage at once so emergency measures can be taken. The Contractor will pay for any required repairs.

H. Intercept and divert surface drainage and precipitation away from excavation through use of dikes, curb walls, ditches, pipes, or other means.

I. Remove and exclude water, including storm water, groundwater, irrigation water, and/or other waters, from all excavations. Dewatering wells, well-points, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level below the bottom of excavations. Water shall be removed and excluded until backfilling is complete and all field soils testing have been completed.

J. Comply with New Mexico state standards and requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

K. Excavation below Fills and Embankments: The subgrade areas beneath embankments shall be excavated to remove not less than the top 1 foot of native material and, where such sub-grade is sloped, the native material shall be benched. After the required excavation or over-

excavation has been completed, the top 12 inches of material shall be scarified and moisture added or material dried to optimum moisture and the exposed surface shall be proof rolled.

L. Excavation under areas to be paved shall extend to the bottom of the sub-base. After the required excavation has been completed, the area shall be scarified a minimum of 12 inches below the subgrade surface and recompacted prior to the placement of the sub-base aggregate and/or base course aggregate. The finished sub-grade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

M. Material beyond prescribed lines which is loosened by the Contractor's operations shall be removed, replaced and/or compacted, as directed by the Engineer, at no additional cost to the Owner.

3.4 FILLING

A. See Section 31 23 23 - Backfill.

3.5 DISPOSAL OF EXCAVATED MATERIALS

A. Excess excavated material or excavated material not suitable for backfill may be disposed of on-site, provided that:
   1. The finished grade substantially conforms with the Drawings, or any deviation therefrom is approved by the Engineer.
      a. Blend with natural terrain.
      b. Minimum slope: 2%.
      c. Maximum slope: 4:1.
   2. All excess excavated material spread on the right-of-way is compacted to the same specifications as final backfill, as set for in Section 31 23 23 - Backfill and the Drawings, and
   3. All on-site disposal of material is approved by the Engineer.

B. Do not dispose of waste material by dumping from tops of slopes.

C. Do not dispose of excess material within 15 feet of any wash, drainage or waterway.

D. Re-seed waste material areas in accordance with Section 32 92 19 - Seeding.

3.6 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557, ASTM D698, AASHTO T180.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D6938.
   2. Moisture Tests: ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Compaction testing shall be done to the extent such that the Owner and Engineer can be reasonably assured that the backfill has been placed in accordance with the requirements of the Contract Documents or in accordance with the NMDOT Standard Specifications for Road and Bridge Construction, whichever is the more stringent. When a testing allowance is established on the Bid Form, the Owner and Engineer will determine the testing frequency to be used throughout the project.

3.8 SCHEDULES

A. Structural Fill:
   1. Fill Type G or H: To subgrade elevation.
   2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities.
2. Compacted fill from top of utility bedding to finished grade.
3. Backfilling and compaction.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods: Concrete materials.
2. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
3. Section 31 23 23 - Backfill: General backfilling.
4. Section 33 11 00 - Water Utility Distribution Piping.

1.2 REFERENCES

A. Geotechnical Report:
1. GeoTest, “Regina MDWCA Naranjo Creek Waterline Replacement,” June 27, 2023.

B. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

C. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

D. American Society for Testing and Materials International (ASTM):
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3).
8. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.
9. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

10. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
11. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
12. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
13. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
14. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.
15. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
16. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
17. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
18. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
19. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
20. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
21. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
22. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
23. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
24. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
25. ASTM D5080 - Rapid Determination of Percent Compaction.
26. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported fill materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

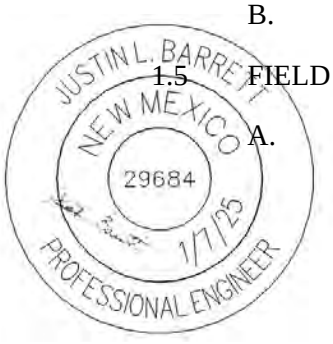
1.4 QUALITY ASSURANCE

A. Perform Work in accordance with applicable New Mexico state standards and specifications of the utility provider.

B. Perform Work in accordance with applicable OSHA trench safety standards.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.



1.6 COORDINATION

A. Section 01 00 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Pipe Bedding and Embedment: As specified in Section 31 23 23.

B. Pipe Backfill: As specified in Section 31 23 23.

C. Structural Fill: As specified in Section 31 23 23.

D. Granular Fill: As specified in Section 31 23 23.

E. Concrete: Structural concrete, as specified in Section 03 05 00, with minimum compressive strength of 4,000 psi. Concrete for thrust blocking with minimum compressive strength of 3,000 psi.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

3.2 PREPARATION

A. Call New Mexico “One Call” at 811 and local utilities not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns and other features remaining as portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 LINES, GRADES AND DIMENSIONS

A. Excavate trench to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required based on field conditions.
   2. Deviations from horizontal and vertical pipe line and grade by Contractor per Section 33 11 00 - Water Utility Distribution Piping.
   3. When bottom of trench is rocky, over-excavate and fill as specified in Section 31 23 23.

B. Excavate trench to minimum width as indicated on Drawings.
   1. Cut trenches to width indicated on Drawings, providing at least 6 inches of clear space between the trench face and the outside diameter of the pipe. The maximum permissible width of the trench shall be the outside diameter of the pipe (or distance between pipes plus pipe diameters in the event that two pipes are buried in the same trench) plus 24 inches, unless otherwise indicated on the Drawings, permission in writing to use a greater width is obtained from the Engineer.
   2. Increase trench width as required to meet required clearances between pipe and trench wall, to avoid voids in the haunch areas of the pipe and to meet embedment compaction requirements or minimum soil cement slurry layer thickness. Increased trench width, if needed to meet these requirements, shall be provided at no additional cost to the Owner.

3.4 TRENCHING

A. Excavate subsoil required for utilities.

B. Remove lumped subsoil, boulders, and rock up to the size that would require special equipment beyond conventional machinery used for trenching, in which case the Engineer should be notified immediately.

C. Allowable Open Trench: Trenches may be opened in advance of pipe placement and backfill operations under the following conditions:
   1. In developed areas and along traveled roadways, no more than 100 feet of trench shall be opened in advance of pipe laying operations. This distance may be reduced due to traffic control considerations. Backfilling shall begin as soon as pipe is laid and inspected and shall keep pace with the pipe laying. In undeveloped areas outside of roadway rights-of-way and away from any vehicular or pedestrian traffic, open trench shall not be advanced more than 500 feet ahead of installed pipe. Whenever local, county, state or federal regulations impose stricter limitations, such regulations will take precedence.
   2. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by traffic weight steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plates may be waived in undeveloped areas, such as where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights, or escape ramps and earthen trench plugs for wildlife, shall be provided and maintained to meet applicable safety

requirements. In no case shall more than 100 feet of trench be left open at end of working day.

3. Do not block vehicular traffic or impede access to homes or businesses.
4. Protect open trench to protect the public, livestock, wildlife and the environment.
5. Contractor is solely responsible for safety of all open trenches and bears sole liability for any incidents or accidents arising from open trenches.
6. The Owner may further restrict the amount of open trench as needed due to safety, land use or environmental considerations.

D. Intercept and divert surface drainage and precipitation away from excavation through use of dikes, curb walls, ditches, pipes, or other means.

E. Dewater and maintain substantially dry subgrade during pipe installation.

1. Remove groundwater by pumping to keep excavations dry.
2. Comply with New Mexico state standards and requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.
3. If a separate bid item is not included on the Bid Form for dewatering, the cost thereof will be considered incidental to the cost of trenching and utility installation.

F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

G. Do not interfere with 45 degree bearing splay of foundations. Any excavation in this area shall be backfilled and compacted using the same materials and methods as structural fill for new buildings. Refer to Section 31 23 23.

H. Slope or shore trench as needed to meet safety requirements. When sidewalls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered. Backfill and compact to reach specified or directed line and grade. Refer to specifications for overexcavation backfill, as set forth in Section 31 23 23.

J. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to specified or directed line and grade. Refer to specifications for overexcavation backfill, as set forth in Section 31 23 23.

K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

L. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

M. Remove excess subsoil not intended for reuse, from site.

N. Protect open trench at all times to prevent danger to the public and to wildlife. Any safety requirements imposed by agencies or entities with jurisdiction must be met.

3.5 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work. If the Engineer orders the sheeting to be left in place for the protection of the work, a payment will be allowed only for the actual cost of the timber left in place.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.6 BACKFILLING OF TRENCHES

A. See Section 31 23 23 - Backfill, Articles 3.3 and 3.4 for general backfill requirements, as well as trench backfill and bedding requirements around pipelines.

3.7 DISPOSAL OF EXCAVATED MATERIALS

A. Excess excavated material or excavated material not suitable for backfill may be disposed of on-site, provided that:
   1. The finished grade substantially conforms with the Drawings, or any deviation therefrom is approved by the Engineer
      a. Blend with natural terrain.
      b. Minimum slope: 2%.
      c. Maximum slope: 4:1.
   2. All excess excavated material spread on the right-of-way is compacted to the same specifications as final backfill, as set forth in Section 31 23 23 - Backfill and the Drawings, and
   3. All on-site disposal of material is approved by the Engineer.

B. Do not dispose of waste material by dumping from tops of slopes.

C. Do not dispose of excess material within 15 feet of any wash, drainage or waterway.

D. Re-seed waste material areas in accordance with Section 32 92 19 - Seeding.

3.8 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.9 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Determine compaction characteristics of materials in accordance with ASTM D698.

C. Classify soils in accordance with ASTM D2487.

D. Perform laboratory material tests in accordance with ASTM D1557.

E. Refer to compaction testing requirements in Section 31 22 13 - Rough Grading and/or Section 31 23 23 - Backfill, Field Quality Control, as applicable.

3.10 PROTECTION OF FINISHED WORK

A. Section 01 00 00 - Execution Requirements: Protecting installed construction.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 23

BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill under paving.
5. Fill for over-excavation.
6. Pipe bedding material.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods: Concrete materials.
2. Section 31 22 13 - Rough Grading: Site filling.
3. Section 31 23 17 - Trenching: Backfilling of utility trenches.
4. Section 33 11 00 - Water Utility Distribution Piping.
5. Section 31 23 24 - Flowable Fill.

1.2 REFERENCES

A. Geotechnical Report
1. Geo-Test, Inc., “Regina MDWCA Naranjo Creek Waterline Replacement,” June 27, 2023.
2. Refer to geotechnical data regarding any issues not specifically addressed in these technical specifications. In the event of any discrepancies or differences in requirements between the geotechnical report and the technical specifications, the more stringent requirement shall apply.

B. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

C. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T99 - Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 3050mm (12-in.) Drop.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

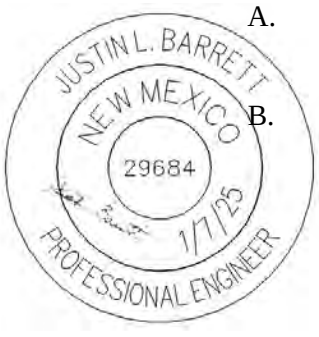
D. American Society for Testing and Materials International (ASTM):
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.

4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3, 2,700 kN-m/m3).
8. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.
9. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
10. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
11. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
12. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
13. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
14. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.
15. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
16. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
17. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
18. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
19. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
20. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
21. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
22. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
23. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
24. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
25. ASTM D5080 - Rapid Determination of Percent Compaction.
26. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Percentage Compaction: Ratio, expressed as percentage, of actual density of material compared with maximum dry density based on Modified Proctor (ASTM D1557).

B. Optimum Moisture Content: Based on Modified Proctor (ASTM D1557).



C. Unified Soil Classification System: Based on ASTM D2487.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures.

B. Submit samples and certified test documentation of all materials to be used.

C. Materials Source: Submit name of imported fill materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Submit field soil test on material in place as backfill and pipe bedding material.

F. Submit construction drawings with compaction test locations marked and labeled with station, date, test number, depth of test below ground surface, and test result.

G. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Suitable materials may be processed on-site, or may be imported. If imported materials are required to meet the quantity requirements of the project, it will be provided at no additional expense to the Owner, unless a unit price item is included for imported materials on the Bid Form. The following types of materials are defined as suitable where scheduled:

1. Type A (three-quarter inch minus aggregate backfill): Crushed rock or gravel, and sand with the gradation requirements below.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 – 50
No.200	0 – 12

2. Type B (Class I crushed stone): Manufactured angular, crushed stone, crushed rock, or crushed slag with the following gradation requirements. The material shall have a minimum sand equivalent value of 75.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 – 50
No. 200	0 - 5

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a No. 4 sieve, and a sand equivalent value not less than 30.
   a. This material to be used only when approved by Engineer.

4. Type D: (pipe bedding material): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 5 percent passing a No. 10 sieve and 1 to 2 percent passing a No. 200 sieve.

5. Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a No. 4 sieve.

6. Type F (coarse drain rock): Crushed rock or gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90- 100
1-inch	20 – 55
3/4-inch	0 – 15
No. 200	0 – 3

7. Type G (aggregate base, base course) as follows:

Sieve Size	Percentage Passing
1-inch	100
3/4 inch	80-100
No.4	30-60
No.10	20-45
No. 200	3-10

8. Type H (graded drain rock): Drain rock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 – 40
No. 8	18 – 33
No. 30	5 – 15
No. 50	0 – 7
No. 200	0 – 3

9. Type I Not Used

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G, and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

11. Type K (topsoil): Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

12. Type L (controlled low strength material): Controlled low strength material shall meet the requirements established in Section 31 23 24 - Flowable Fill. Controlled low strength material, also referred to as 'soil cement slurry' or 'flowable fill' shall meet the following requirements:
    a. Slurry shall have a 7-day compressive strength of not less than 50 psi and not more than 150 psi. The compressive strength shall be determined in accordance with ASTM D4832.
    b. Typical cement content: 3 to 10 percent by dry weight of soil to obtain specified compressive strength.
    c. The water-cement ratio of the mix shall not exceed 3.5:1. The water content shall not exceed that required to provide a mix that will flow and can be pumped.
    d. The consistency of the slurry shall be such that the slurry flows easily into all openings between the pipe and the lower portion of the trench.

13. Type M (aggregate sub-base, structural fill). Well-graded crushed rock or natural gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
4-inch	100
3-inch	95 100
No. 200	3 - 15

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the Engineer shall be immediately notified. In case of conflict between types of pipe embedment backfills, the Contractor is to use the agency-specified backfill material if that material provides a greater degree of structural support to the pipe, as determined by the Engineer. In case of conflict between types of trench or final backfill types, the Contractor shall use the agency-specified backfill material if that material provides the greater in-place density after compaction.

C. Fill and backfill types, including use of native soil, shall be used in accordance with the following provisions. Native soil used for fill and backfill must meet the requirements of the type of material specified below and as shown for the corresponding type of material shown in 2.1.A above.
    1. Embankment fills shall be constructed of Type M material, as defined herein, or other material approved by the Project Engineer. Drainage structures embankments shall be backfilled with materials used in original construction.
    2. Pipe zone backfill shall consist of the following materials for each pipe material listed below. All pipe bedding material shall receive prior approval by the Engineer before use.
        a. Concrete pipe, shall be provided Type A or B pipe bedding and embedment backfill material, or native material that meets the criteria described below, and is acceptable to the Engineer.

b. Plastic pipe shall be provided Type D bedding and embedment zone material, or native material that meets the criteria described below, and is acceptable to the Engineer.
   1) In trenches where dewatering is required, the pipe bedding material and embankment backfill shall be Type A or B as directed by the Engineer.

c. Excavated native material will be allowed, provided that it is free draining and contains no organic materials, no rocks larger than 1/2-inch, clods or frozen lumps. A proctor of this material shall be submitted to the Engineer for review and approval before use. If native backfill material is approved, on-site screening may be required by Engineer to remove any rock material larger than 1/2-inch at no additional expense to the Owner. The location of such sites must be coordinated with the Owner.

3. Trench zone backfill for pipelines shall be any of Types A through H backfill materials or any mixture thereof.
4. Final backfill material for pipelines under paved areas shall be Type G backfill material.
5. Final backfill under areas not paved shall be the same material as that used for trench backfill, unless otherwise indicated.
6. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.
7. Aggregate base materials under pavements, curb and gutter, and sidewalk shall be Type G material constructed to the thickness indicated.
8. Aggregate sub-base shall be Type M material.
9. Backfill around structures shall be Types A through Type H materials, or any mixture thereof.
10. Under structures where groundwater must be removed to allow placement of concrete, Type F material shall be used. Before the Type F material is placed, filter fabric shall be placed over the exposed foundation. Filter fabric shall be Mirafi 140 N, Mirafi 700X, or equal.
11. Under all other structures, Type G or H material shall be used.
12. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 8 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING FOR STRUCTURES, SITE WORK AND APPURTENANCES

A. Backfill areas to contours and elevations with unfrozen materials as indicated on the Drawings or as directed by the Engineer.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer.

D. Place material in continuous layers as follows:
1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 6 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

E. Employ placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Slope grade away from building minimum 6 inches in 10 ft, unless noted otherwise.

H. Make gradual grade changes. Blend slope into level areas.

I. Shape and drain embankments and excavations, maintain ditches and drains to provide drainage at all times. Protect graded areas against action of elements prior to acceptance of work, and reestablish grade where settlement or erosion occurs.

J. Bench hillside slopes or fills to key the embankment. Remove and re-compact a minimum of 12 inches normal to the slope of the hillside or fill as the embankment or fill is brought up in layers.

K. Under surfaced or paved roads, driveways or parking areas, apply base course at uppermost layer of backfill to same thickness as existing driving surface, or 6 inches, whichever is greater. If paved, apply pavement patch to thickness equal to or greater than existing pavement.

L. Remove surplus backfill materials from site.

M. Leave fill material stockpile areas free of excess fill materials.

N. Repair or replace remaining items damaged by excavation or filling.

3.4 BACKFILLING OF TRENCHES

A. Place a minimum of 4 inches of bedding material in pipe trenches to lines and grades indicated on Drawings or as directed by Engineer and compact before pipe is laid. Grade bedding material parallel to bottom of pipe.

B. Do not place material when either the material or the surface upon which it is to be placed is frozen.

C. Pipe zone backfill materials shall be manually spread around the pipe so that, when compacted, the pipe zone backfill will provide uniform bearing and side support.
1. Exercise care not to damage pipe or appurtenances when placing embedment material.
2. Maintain optimum moisture content of fill materials to attain required compaction density.
3. Ensure material is placed to equal height on both sides of pipe to avoid unequal loading and possible lateral displacement of the pipe. Elevation difference of embedment between each side of pipe shall not exceed 6 inches.
4. Place material in uniform layers.
5. Work material into pipe haunches to prevent voids and achieve specified compaction under the haunches.
6. No backfilling by machine methods permitted until a minimum of one foot of material has been placed by hand over the top of the pipe.
7. Place material to a compacted depth of 12 inches over the top of the pipe, 15 inches of compacted depth over the top of the pipe in paved or traffic areas, and compacted by hand held compacting tools before other backfilling is done.

D. When using flowable fill: See Technical Specification 31 23 24 - Flowable Fill.

E. If pipe laying operations are interrupted for more than 24 hours, cover pipe laid in the trench with backfill.

F. When the bottom of the trench is unstable, an additional 4 inches shall be over-excavated and filled with bedding material before pipe is laid.

G. Where rock is present and where there is concern that settling rocks in the surrounding material may rupture the pipeline, the amount of bedding material below and above the

pipe shall be increased. In these cases there will be 8 inches of bedding material below the pipe and 15 inches above, as directed by the Engineer.

H. When using free-draining crushed rock or gravel for embedment on stretches longer than 300 feet, install trench plugs composed of silty, non-plastic material at 300 foot intervals to impede flow of trench water through the embedment.

I. Under surfaced or paved roads, driveways or parking areas, apply base course at uppermost layer of backfill to same thickness as existing driving surface, or 6 inches, whichever is greater. If paved, apply pavement patch to thickness equal to or greater than existing pavement.

3.5 COMPACTION

A. Do not place and compact soil under the following conditions:
1. Ambient air temperature below freezing.
2. Rain that creates puddles in clayey or silty materials.
3. Ice or snow pockets visible in material being placed.

B. Surface Preparation:
1. Prepare surface so that first compacted lift will be placed on firm, stable base. Compact surface to specified percent compaction, if necessary.
2. For water-retaining compacted fill, scarify and moisten surface to provide satisfactory bonding surface before placing first layer of material to be compacted.
3. Do not place material to be compacted on frozen surface.

C. Compact material in trenches in layers having approximately the same top elevation on both sides of the pipeline to avoid unequal loading and displacement of the pipe.

D. Placement:
1. Place soil to be compacted in horizontal layers.
2. Blend materials as needed to ensure compacted fill is homogenous and free from lenses, pockets, streaks, voids, laminations and other imperfections.

E. Compaction Procedures:
1. Silty or Clayey Material:
   a. Compact with mechanical impact tampers, tamping rollers, vibrating pad foot rollers, rubber tire rollers or other suitable compaction equipment.
   b. Uniformly distribute equipment passes.
   c. Compact in horizontal layers to compacted thickness of 6 inches or less.
2. Cohesionless Free-Draining Material: Compact in horizontal layers to maximum compacted thickness of:
   a. Tampers and rollers: 6 inches
   b. Crawler-type tractors, vibrating drum rollers, surface vibrators or similar equipment: 12 inches
   c. Saturation and internal vibration: Penetrating depth of vibrator.
3. When compacting pipe embedment material, exercise care not to damage the pipe or appurtenances with compaction equipment. Do not apply compaction equipment directly above the pipe.

4. Demonstration: Lift thicknesses may vary depending on equipment and methods. Field adjustments to the specified lift thicknesses may be allowed or required. Contractor shall demonstrate that proposed equipment and methods will meet required compaction for the proposed lift thickness.
5. Flooding and jetting is not allowed unless specifically approved by the Engineer.

F. Moisture Content:
1. Optimum moisture content for each soil type, whether native soil or imported material, shall be determined by the Modified Proctor method, ASTM D1557.
2. Moisture content during compaction shall be no more than 2 percentage points wet or dry of optimum moisture content.
3. Moisten or aerate material, as necessary, to provide specified moisture content. Add water to soil in increments that will permit moisture content to be uniform and homogenous through each layer after mixing.
4. Add no more than 2 percent water to fill by sprinkling just prior to compaction when fill is clayey and contains dry clods of clay.
   a. If clayey soil is more than 2 percent below optimum moisture, pre-conditioning and curing may be required to obtain uniform and homogenous distribution of moisture in clods.
   b. Use of disks, harrows or rakes may be required to blend moisture prior to placement and compaction.
5. For cohesionless soils, add water as necessary during compaction, as these soils are free-draining.

G. Minimum Percent Compaction:
1. Over-excavation: Backfill of over-excavation to specified or directed lines shall be compacted to same percent compaction as embedment material or undisturbed foundation material, whichever is greater. If the in-place compaction of the undisturbed foundation material is greater than 95%, the over-excavation backfill may be compacted to 95%.
2. Pipe Bedding Material: Place and compact pipe bedding material as indicated on Drawings for given soil classification, pipe wall thickness, and depth of cover. If native material meets grading requirements and is used, compact to 95%.
3. Initial and Final Backfill: For trenches outside of roads, driveways, parking areas or wash crossings, compact to 90%, or to a density equal to that of the adjacent undisturbed soil, as directed by the Engineer. For trenches within the driving surfaces of roads, driveways or parking areas (both paved and unpaved) or within wash crossings, compact to 95%.
4. Embankments: Compact to same requirements as Final Backfill.
5. Under buildings, tanks, slabs and other structures: Compact to 95%.
6. Note that all Percent Compaction values in these Technical Specifications and Drawings are based on Modified Proctor, ASTM D1557, unless otherwise noted.

H. Soil Cement Slurry may be used in trenches, at Contractor's option and expense, to replace bedding, embedment or backfill materials where it is not practical to reach minimum compaction requirements using select material.
1. If soil cement slurry is to be used in lieu of embedment material, soil cement slurry shall also replace the bedding material. Do not use soil cement slurry for embedment on top of select material bedding.

3.6 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling within Building Areas: Plus or minus 1 inch from required elevations.

C. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

E. Percent Compaction: Shall meet minimum required compaction as set forth in these specifications

F. Moisture Content: As set forth in these specifications.

3.7 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, Adjusting, and Balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D6938.
2. Moisture Tests: ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove material, replace, compact, and retest.

E. Provide test trenches and excavations including excavation, trench support, and groundwater removal for the soils testing operations, at the locations and depths required. The cost of all work associated with accessing, preparing, or time delays for testing to be included in the unit price of the applicable pay item being tested.

F. Compaction testing shall be done to the extent such that the Owner and Engineer can be reasonably assured that the backfill has been placed in accordance with the requirements of the Contract Documents, or as required by the utility for which the trenching is being provided, whichever is the more stringent. When a testing allowance is established on the Bid Form, the Owner and Engineer will determine the testing frequency to be used throughout the project. If no allowance is included, the frequency of testing shall be at least once every 400 linear feet of trenching, or at least once every 200 square feet below structural slabs.

G. Correction of Substandard Work: All fill and backfill represented by tests that fail to meet compaction, moisture content, soil classification or other specifications shall be uncovered as needed, replaced as needed, re-compacted and re-tested until all specifications are met, at no additional expense to the Owner.

1. Elevations, lines and grades of replaced material, as well as of pipe and other structures resting against such material, shall be re-surveyed at the direction of the Engineer. Contractor shall correct elevations, lines and grades as needed, at no additional expense to the Owner.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 00 00 - Execution Requirements: Protecting Installed Construction.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 23 24

FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Flowable fill for:
      a. Utility bedding.

B. Related Sections:
   1. Section 31 23 17 - Trenching: Soil and aggregate backfill for utility trenches.
   2. Section 31 23 23 - Backfill: Soil and aggregate backfill for structures.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Work Included in Payment: The following work will be considered as included in the payment for the main item and will not be measured or paid for separately. Unless otherwise noted, when called for in the contract, or the Contractor proposes its use and is approved by the Engineer, flowable fill can be used for backfill in utility installations. No measurement or payment will be made for work and materials associated with backfilling or bedding pipes with flowable fill. This will be included in the contract unit price per linear foot of utility pipe.

B. Areas of flowable fill detailed on plans and included on the Bid Form shall be paid at the cubic yard quantity. The volume shall be based on the minimum trench width as shown on the trenching detail, and the minimum depth of line as shown on the line profile plan, less the volume of pipe and other embedment materials used.

1.3 REFERENCES

A. American Society for Testing and Materials International (ASTM):
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   5. ASTM C403/C403M - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
   6. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
   7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
   8. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
   9. ASTM C1040 - Standard Test Methods for Density of Unhardened and Hardened Concrete In Place By Nuclear Methods.

10. ASTM D558 - Standard Test Methods for Moisture-Density Relations of Soil-Cement Mixtures.
11. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, manhole, tank or cable.

B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required such as fill for utility trenches, bridge abutments, and culverts. Excavatable Flowable Fill shall not exceed NMDOT Section 516, compressive strength of 150 psi at 28 days.

C. Non-Excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated such as fill below structure foundations and filling abandoned utilities.

1.5 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of flowable fill materials suppliers. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

C. Mix Design:
1. Submit flowable fill mix design for each specified strength. Submit separate mix designs when admixtures are require for the following:
   a. Flowable fill work during hot and cold weather.
   b. Air entrained flowable fill work.
2. Identify design mix ingredients, proportions, properties, admixtures, and tests.
3. Submit test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Delivery Tickets:
1. Submit duplicate delivery tickets indicating actual materials delivered to Project site.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico State Department of Transportation Standards.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 00 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

PART 2 PRODUCTS

2.1 FLOWABLE FILL

A. Furnish materials in accordance with Section 516 of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Construction, latest edition.

B. Flowable Fill: Excavatable type.

2.2 MIXES

A. Mix and deliver flowable fill in accordance with ASTM C94/C94M, Option C.

B. Flowable Fill Design Mix:

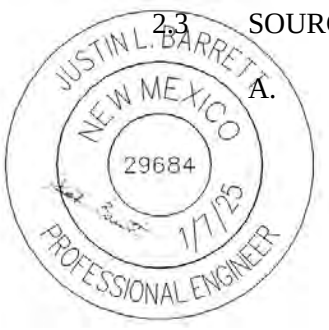
ITEM	EXCAVATABLE	NON-EXCAVATABLE
Cement Content	75-100 lbs/yd^3	100-150 lbs/yd^3
Fly Ash Content	None	150-600 lbs/yd^3
Water Content	As specified	As specified
Air Entrainment	5-35 percent	5-15 percent
28 Day Compressive Strength	Maximum 100 psi.	Minimum 125 psi
Unit Mass (Wet)	80-110 lbs/ft^3	100-125 lbs/ft^3
Temperature, Min., at point of delivery	50 degrees F	50 degrees F

C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.3 SOURCE QUALITY CONTROL

A. Section 01 00 00 - Quality Requirements: Testing, inspection and analysis requirements.



B. Test properties of flowable fill design mix and certify results for the following:
   1. Design mix proportions by weight of each material.
   2. Aggregate: ASTM C33 for material properties and gradation.
   3. Properties of plastic flowable fill design mix including:
      a. Temperature.
      b. Slump.
      c. Air entrainment.
      d. Wet unit mass.
      e. Yield.
      f. Cement factor.
   4. Properties of hardened flowable fill design mix including:
      a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
      b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.

C. Prepare delivery tickets containing the following information:
   1. Project Designation.
   2. Date.
   3. Time.
   4. Class and Quantity of flowable fill.
   5. Actual batch proportions.
   6. Free moisture content of aggregate.
   7. Quantity of water withheld.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trenching specified in Section 31 23 17 is complete.

C. Verify excavation is dry and dewatering system is operating.

3.2 PREPARATION

A. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

B. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.

C. Protect utilities to prevent intrusion of flowable fill.

3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

A. Place flowable fill by chute, pumping or other methods approved by Engineer.
   1. When required, place flowable fill under water using tremie procedure.
   2. Do not place flowable fill through flowing water.
   3. Place flowable fill uniformly to prevent voids in or segregation of the bedding and filling material.
   4. Secure the utility from movement and to compensate for buoyancy.

B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.

C. Place flowable fill evenly on both sides of utilities to maintain alignment.

D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

E. Do not place the flowable fill on frozen ground or while it is raining. Protect flowable fill from flooding for at least 24 hours after placement.

3.4 FIELD QUALITY CONTROL

A. Section 01 00 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform testing in accordance with ASTM C94/C94M.
   1. Take samples for tests for every 150 cu yd of flowable fill, or fraction thereof, installed each day.
   2. Sample, prepare and test four compressive strength test cylinders in accordance with ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
   3. Measure temperature at point of delivery when samples are prepared.

C. Allow flowable fill to set for 24 hours before installing asphalt.

D. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.
   1. Test Requirements:
      a. Minimum temperature at point of delivery.
      b. Compressive strength requirements for each type of fill.
   2. Documentation: Duplicate delivery tickets.

3.5 CLEANING

A. Section 01 00 00 - Execution Requirements: Requirements for cleaning.

B. Remove spilled and excess flowable fill from Project site.

C. Restore facilities and site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION

SECTION 33 05 16.13

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the furnishing and installation of all prefabricated manholes and vaults, complete with adapter rings, steps (if required), frame, cover, warning signs, pipe connections, and cast-in-place or prefabricated base, and any other appurtenances, as shown and specified herein, in accordance with the requirements of the Contract Documents. Precast manholes and vaults for this project are for equipment placement, protection and access.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods.
2. Section 31 23 17 - Trenching.
3. Section 31 23 23 - Backfill.
4. Section 33 11 00 - Water Utility Distribution Piping.
5. Section 33 12 16 - Water Utility Distribution Valves.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM A48 - Specification for Gray Iron Castings.
2. ASTM C150 - Specification for Portland Cement.
3. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
4. ASTM C443 - Rubber Gaskets.
5. ASTM C270 - Cement Mortar.
6. ASTM C858 - Underground Precast Concrete Utility Structures.

1.3 SUBMITTALS

A. Furnish complete shop drawings for all precast manhole and vault sections, cast iron frames and covers, and appurtenances for review by the Engineer.

B. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements

1.4 QUALITY ASSURANCE

A. After installation, the Contractor shall demonstrate that all manholes and vaults have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the testing and backfilling has been carried out in accordance with the Contract Documents.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manholes and vaults shall be constructed of precast concrete manhole rings or rectangles. Precast concrete rings and rectangles shall be manufactured by a process that will produce a dense, homogeneous concrete ring or rectangle of high quality. The rings or rectangles shall conform to the requirements of ASTM C478. Cement used in manufacturing the rings and rectangles shall be Type I/II Portland Cement as specified in ASTM C150. Manhole barrel and vault sections shall be provided with steps as specified or called for on the details. Steps shall be equally spaced, with the first step being placed 2 feet from the top of the manhole ring or vault. Mortar for bonding joints shall consist of one part cement to 2-1/2 parts of sand, by volume. Manholes and vaults with precast concrete bases and formed channel inverts to match the adjoining pipes. Precast manhole top sections shall be eccentric conical shape. Precast manhole bases shall have cast-in-adapters to accommodate a watertight connection with the utility pipe. Precast manhole barrels shall be joined with polybutylene “rubberneck” or “ramneck” to form a watertight seal between sections.

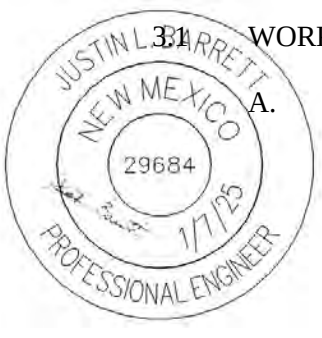
B. Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A48, Class 30. Unless otherwise shown, cast iron covers and frames shall be heavy duty, traffic weight rated as manufactured by NEENAH Foundry Company, meeting NEENAH R-1924, or equal, with embossed lettering to meet the requirements of the OWNER. Frame and cover shall be designed for H-20 traffic loading.

C. Coating of Manholes:
1. Exterior of Manholes: Exterior coating of manholes shall be required in areas where ground water is present. The coating shall be a water-proofing type of bitumastic or asphaltic material, as approved by the Engineer. Application shall be in accordance with the manufacturer's published recommendations.
2. Interior of Manholes: Interior coating of manholes shall be required only when specified on the Drawings. The coating shall be an epoxy resin-type material such as: “Sikagard 62” by Sika Corporation, "Zebron," "Plastite 7122," or approved equal, and shall be capable of protecting the concrete from deterioration due to a gaseous environment. Application shall be in accordance with the manufacturer's published recommendations.
3. Plastering of Manholes: The work shall include the coating of the surface of existing block manholes with plaster as required on the Drawings.

D. When required, steps shall be steel reinforced plastic, reinforcing shall be 3/8-inch diameter. Plastic shall be copolymer polypropylene meeting requirements of ASTM D4101, Grade 49108.

PART 3 EXECUTION

3.1 WORKMANSHIP



A. All precast concrete manholes and vaults shall be installed in strict conformance with the manufacturer’s written instructions, on a well-compacted foundation, as specified in the

applicable sections of these Specifications. Manhole and vault excavations shall be sufficiently deep to allow a minimum of 12 inches of bedding material below the base on top of 12 in. of native soil compacted to 95% Standard Proctor.

B. Manhole and vault bases shall be set and leveled before receiving the additional sections.

C. Manhole barrels and vault sections will be set to form watertight seals between sections. Lifting holes will be grouted to seal out water. Manhole barrels and vault sections to be set with the steps oriented per Engineer's instructions, always away from the roadway.

D. Ring and cover will be adjusted with concrete or brick rings, set with non-shrink grout, not more than 6 inches in height. Ring and cover will form a watertight seal between the frame and manhole barrel, vault section, or adjusting rings by using a bituminous sealing material.

END OF SECTION

SECTION 33 11 00

WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for public line including potable water line.
2. Tapping Sleeves, Tees and Valves.
3. Underground and Aboveground Pipe Markers.
4. Bedding and Cover Materials.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods.
2. Section 31 23 17 - Trenching:
3. Section 31 23 23 - Backfill
4. Section 33 05 16.13 - Precast Concrete Utility Structures.
5. Section 33 12 13 - Water Service Connections.
6. Section 33 12 16 - Water Utility Distribution Valves.
7. Section 33 12 19 - Hydrants.
8. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
1. Basis of Measurement: By the linear foot.
2. Basis of Payment: Includes trenching, hand trimming excavation, piping and fittings, all valves and appurtenances not listed separately on the Bid Form, bedding, backfill, compaction, tracer wire, detectable warning tape, above ground pipe marker posts, concrete thrust restraints (where applicable), concrete wall anchors (if not separately listed on Bid Form), mechanical joint restraints, connection to public utility water source (if not separately listed on Bid Form). Special excavation methods for trenching in rock or hard soils, rock removal and disposal, and/or imported bedding material, if required to meet the project specifications, shall be considered incidental to the cost of the pipe installation. Soil cement, if used, shall be considered incidental to the cost of the pipe installation.
3. The cost of laboratory testing for water quality and the cost of compaction testing shall be reimbursed from testing allowance to the Contractor, upon submittal of invoices. Work performed by Contractor related to such testing shall be considered incidental and shall not be reimbursable from testing allowance. Work shall be coordinated and directed by Engineer. Should initial test fail, Contractor shall pay for all subsequent testing until the results indicate full compliance with the Contract Documents.

4. The cost of work associated with hydrostatic pressure testing and testing of material welds, etc. shall be considered incidental to related work and not be reimbursed. Work shall be coordinated and directed by Engineer.

B. Fittings:
1. Basis of Measurement: Each.
2. Basis of Payment: Includes fittings, all appurtenances not listed separately on the Bid Form, bedding, pipe joint restraints, and connection of fittings to pipe.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers (ASME):
1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

C. American Society for Testing and Materials International (ASTM):
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
6. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
9. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
13. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
14. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
15. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

16. ASTM F2634 - Standard Test Method for Laboratory Testing of Polyethylene (PE) Butt Fusion Joints using Tensile-Impact Method.

D. American Water Works Association (AWWA):
1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. (76 mm through 1,219 mm), for Water.
4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C116 - ANSI Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
7. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
8. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
9. AWWA C200 - Steel Water Pipe 6 In. (150 mm) and Larger.
10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied.
11. AWWA C206 - Field Welding of Steel Water Pipe.
12. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. through 144 In. (100 mm through 3,600 mm).
13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
14. AWWA C209 - Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
15. AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
16. AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances.
17. AWWA C605 - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
18. AWWA C606 - Grooved and Shouldered Joints.
19. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1,500 mm), for Water Distribution.
20. AWWA C901 - Polyethylene Pressure Pipe and Tubing, 1/2 In. through 3 In. (13 mm through 76 mm), for Water Service.
21. AWWA C906 - Polyethylene Pressure Pipe and Fittings, 4 In. through 63 In. (100 mm through 1,575 mm), for Water Distribution and Transmission).

E. Manufacturer's Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Agency
1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

G. National Sanitation Foundation (NSF):
1. NSF-14 - Plastics Piping System Components and Related Materials
2. NSF-61 - Drinking Water System Components-Health Effects

H. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

I. Plastic Pipe Institute (PPI):
1. TR-33 - Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe.

J. American Welding Society (AWS):
1. AWS D1.1 - Structural Welding Code

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings and accessories, and testing equipment.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

D. Testing Plan: Contractor must submit proposed testing procedure specific to the project, including identifying filling locations, and equipment to be employed for hydrostatic testing of lines, as well as continuity testing for tracer wire, for approval by Engineer.

E. Contractor shall submit a joint restraint table for all types of restrained joints to be used for the project based on the manufacturer’s specifications and calculations.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, connections, thrust restraints, and invert elevations. Refer to paragraph 1.51 of Section 01 00 00.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with these specifications, as well as the most recent edition of New Mexico Standard Specifications for Public Works Construction with latest revisions. The most stringent requirement shall apply.

B. All piping, fittings, valves, hydrants and any other potable water system appurtenances shall comply with the "Reduction of Lead in Drinking Water Act", in effect as of 2014, or any subsequent revision thereof.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 00 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property without prior authorization, or in areas obstructing pedestrian or vehicular traffic.

D. Store polyethylene materials out of sunlight.

E. Flexible pipe shall be braced as required to maintain roundness of +/- 1% during shipping and handling.

F. Coated pipe shall be shipped on bunks and secured with nylon belt tie down straps or padded banding over braces, and shall be stored on padded skids or other suitable means to prevent damage to coating.

G. Coated pipe shall be handled with wide belt slings, padded forks or other means to prevent damage to coating. Chains, cables or other equipment likely to damage coating or pipe shall not be used.

H. Prior to shipment and again prior to installation, all materials shall be visually inspected for damage, including coatings and surfaces. Any damaged materials shall be repaired to original standards or replaced.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 GENERAL

A. All equipment that comes in contact with either potable water or products that support the production of potable water must comply with NSF/ANSI Standard 61 as available.

2.2 WATER PIPING AND FITTINGS

A. Ductile Iron Pipe: Bituminous outside coating: AWWA C151, Pipe Cement-Mortar Lining: AWWA C104, Polyethylene Encasement: AWWA C105.
   1. Pipe Class: AWWA C151, for nominal thickness, rated water working pressure and maximum depth of cover.
   2. Fittings: Ductile iron, Compact MJ fittings AWWA C153.
      a. Interior/Exterior Lining: Bituminous outside coating: AWWA C151, cement-mortar lining: AWWA C104.
      b. Pressure rating of at least 250 psi.
      c. Marked with pressure rating, nominal diameter of opening, manufacturers' identification, country where cast, and degree of bend.
   3. Joints:
      a. Mechanical and Push-On Joints: AWWA C111.
      b. All gaskets and joints shall be rated to the maximum rated pressure of the pipe.
      c. Use rubber gaskets manufactured and tested in accordance with ASTM F477. All gaskets shall be constructed of Nitrile/Buna-N or Viton material
      d. Flanged Joints: AWWA C115; ASME B16.1.
      e. Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal, for fittings of 3" diameter and greater, thrust blocking for fittings less than 3" diameter. Installation and spacing for joint restraints as per manufacturer's specifications.
   4. Jackets: AWWA C105 polyethylene jacket.
      a. Installation Method "A".
      b. Two separate, independently applied polyethylene jackets shall be applied to all buried ductile iron pipe. At least 12" separation, measured longitudinally along the axis of the pipe, shall be maintained between the seams of the two layers.
   5. Bolts:
      a. All buried bolts, other than stainless steel bolts, shall be coated with field-applied coal tar epoxy.

B. Polyvinyl Chloride (PVC): AWWA C900, with Dimension Ratio (DR) of DR18 for pipe 4" in diameter up to 36", and DR21 for pipe greater than 36", unless otherwise identified on the Drawings or on the Bid Form. ASTM D1785, PVC 1120 or 1220, NSF approved, Schedule 40, or as scheduled, for all PVC pipe less than 2" diameter:
   1. Fittings: Ductile iron, Compact MJ fittings AWWA C153, on all PVC pipe 4" diameter and greater.
      a. Interior/Exterior Lining: Bituminous outside coating: AWWA C151, cement-mortar lining: AWWA C104.
      b. Pressure rating of at least 250 psi.
      c. Marked with pressure rating, nominal diameter of opening, manufacturers' identification, country where cast, and degree of bend.
      d. ASTM D1785, Schedule 40, for all PVC pipe less than 4" diameter.

C. Stainless Steel Pipe: AWWA C220, Stainless Steel Pipe, ½" and Larger, ASTM A312/A312M, Schedule 40S, threaded
   1. Material: 304
   2. Fittings, Threaded: AWWA C226, Stainless Steel Fittings for Waterworks Service, sizes ½ inch through 72 inch

2.3 TAPPING SLEEVES, TEES AND VALVES

A. Tapping Sleeves and Saddles:
   1. Manufacturers:
      a. Mueller Co.
      b. Kennedy Valve Co.
      c. Romac Industries, Inc.
      d. JCM Industries
      e. Ford Meter Box Company, Inc.
      f. Smith-Blair, Inc.
      g. Substitutions: Approved equal.
   2. For taps 2-inches or smaller, use nylon coated ductile iron tapping saddles with dual compression straps.
   3. For taps larger than 2-inches, use fusion-bonded epoxy-coated steel.
   4. All saddles shall be specifically designed for use on the type of piping that is being tapped.
   5. All bands, straps, bolts, nuts and washers shall be SS 304. All bolts shall be provided by manufacturer especially for use with their respective components.
   6. Saddle Working pressure rating: 350 psi.
   7. Sleeve Working pressure rating: 175 psi.
   8. Tapped Outlet: FNPT or as indicated on Drawings.
   9. All pipe taps shall be made with an engineer approved "tapping machine".
   10. Refer to Section 31 12 16 for specification on gate valve to install as tapping valve on sleeve.

B. Tapping Valves:
   1. Manufacturers:
      a. Mueller Co.
      b. U.S. Pipe
      c. Kennedy Valve Co.
      d. Or approved equal
      e. Substitutions: Section 01 00 00 - Product Requirements.
   2. AWWA C509, resilient wedge tapping valve with non-rising stem. Inlet flanges shall conform to ANSI B16.1, Pressure Rating of 350 psi and MSS SP-60. Mechanical joint outlets shall conform to AWWA C111.

2.4 UNDERGROUND PIPE MARKERS

A. Furnish materials in accordance with the following, as well as the New Mexico Standard Specifications for Public Works Construction, with latest revisions. The most stringent requirement shall apply.

B. Tracer Wire: 12 AWG, Solid Copper, Single Conductor, 30 volts, Blue Jacket, UF-XHHW wire or equal, for underground installation.

C. Underground Utility Marking Tape: Bright colored, continuously printed, minimum 6 inches wide by 4-mil thick, manufactured for direct burial service, imprinted with "BURIED WATER SERVICE" (or similar wording) in large letters, on blue tape in conformance with APWA color code specifications for underground tape systems. The tape shall be constructed of material that is impervious to alkalis, acids, chemical reagents, and solvents found in the soils.

D. Splice Connectors: Model LV 9500 Blazing Snap-locking waterproof connectors pre-filled with silicone or engineer approved equal.

2.5 ABOVEGROUND PIPE MARKERS

A. Carsonite marker posts, blue, with Owner-specified decals furnished and installed by the Contractor, as per corresponding detail in the Drawings.

2.6 PIPE INSULATION

A. Fiberglass Insulation Wrap meeting a minimum value of R6.

B. Rigid Fiberglass Insulation meeting a minimum valve of R6.

2.7 PIPE SUPPORTS AND ANCHORING

A. Metal for pipe support brackets: ASTM A123/A123M, galvanized structural steel thoroughly coated with bituminous paint.

B. Metal tie rods and clamps or lugs: Galvanized steel sized in accordance with NFPA 24 thoroughly coated with bituminous paint.

2.8 BEDDING AND BACKFILL MATERIALS

A. Bedding: Fill Type as specified in Section 31 23 23.

B. Soil Backfill from Above Pipe to Finish Grade: Soil Type as specified in Section 31 23 23. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.9 BOLTS AND NUTS

A. Zinc-plated or fluoropolymer coated bolts and nuts shall be used for the installation of pipelines up to 500 mm (20") diameter and shall be carbon steel conforming to ASTM A307, Grade A, unless otherwise indicated on the approved drawings. Bolts and nuts shall have standard ANSI B1.1, Class 2A coarse threads.

B. Stainless steel bolts and nuts shall be used for the installation of pipelines 600 mm (24") diameter and larger and for submerged flanges. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts, and Grade 8M for nuts.

C. All bolt heads and nuts shall be hexagonal, except where special shapes are required. Bolts shall be of such length that not less than 6.4 mm (¼") or more than 12.7 mm (½") shall project past the nut in tightened position.

2.10 ACCESSORIES

A. Concrete for Thrust Restraints: Conform to Section 03 30 00 [03 05 00], with minimum compressive strength of 3,000 psi.

B. Steel rods, bolt, lugs and brackets: ASTM A36/A36M or ASTM A307 carbon steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing utility water main size, location, and invert, are as indicated on Drawings.

3.2 PREPARATION

A. Pre-Construction Site Photos:
1. If required in the Contract Documents, take photographs or videotape along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing site features that may potentially be impacted by the construction work.
3. Include project description, date taken and sequential number on back of each photograph.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

E. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

3.3 TRENCHING AND BACKFILL

A. Excavate trenches in accordance with Section 31 23 17, including dewatering of excavations as required, to maintain dry conditions and preserve final grades at bottom of excavation.

B. Place bedding and trench backfill material in accordance with Section 31 23 23.

3.4 INSTALLATION - PIPE

A. Install PVC pipe in accordance with AWWA C605. Use only lubricants supplied by the pipe manufacturer and apply in accordance with manufacturer's recommendations. Clean the gasket, bell, groove and spigot immediately prior to connecting pipe joints.

B. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on Drawings. Inspect each pipe and fitting prior to lowering into trench to ensure there is no damage to the pipe, fitting or coatings. Repair any damage prior to installation. Clean ends of pipe and remove foreign material from inside of pipe and fittings.

C. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

D. Maintain 10 foot horizontal separation of water main from sewer piping in accordance with local code.

E. Install pipe to indicated elevation to within tolerance of 3 inches.

F. Route pipe in straight line. Relay pipe that is out of alignment or grade.

G. Twenty-foot lengths (20') of PVC pipe shall not be deflected more than 2% of their length (5") either horizontally or vertically. Any sections of pipe less than twenty feet (20') in length shall not be deflected.

H. PVC pipe deflections may be made either at joints or by pipe bending.
1. Deflection both at joints and by pipe bending shall not exceed maximum deflection recommendations by the pipe manufacturer or AWWA C605. In the case of a discrepancy between these recommendations, the smaller maximum deflection value shall apply.

I. Install ductile iron piping and fittings to AWWA C600. Encase all ductile iron pipe and fittings in two separate, independently wrapped layers of polyethylene, per AWWA C105, Method "A". No tears, cuts, rips or other breaks in the polyethylene encasement shall be acceptable. No dirt, water or debris inside the encasement shall be acceptable. Bond all joints with two bonds per joint.

J. Weld pipe in accordance with AWWA C206. Weld joints in accordance with AWWA C205.

K. Flanged Joints: Not to be used in underground installations except within approved underground structures.

L. Ductile iron and steel pipe deflections may be made at joints, provided pipe manufacturer's allowable deflection limits are not exceeded.

M. Install pipe with no high points. If unforeseen field conditions arise which necessitate high points, increase pipe bury depth or install air release valves as directed by Engineer.

N. Install pipe to have bearing along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in wet or frozen trench.

O. Prevent foreign material from entering pipe during placement.

P. Install pipe to allow for expansion and contraction without stressing pipe or joints.

Q. Close pipe openings with watertight plugs during work stoppages.

R. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

S. Establish elevations of buried piping with not less than 4 foot of cover. Measure depth of cover from final surface grade to top of pipe barrel.

T. Install tracer wire continuous, taped to top of pipeline at regular intervals not exceeding 24"; coordinate with Sections 31 23 17 and 31 23 23. Continuity of tracer wire shall be tested periodically as indicated by Engineer, and prior to final acceptance of work. Any segment of tracer wire that fails the continuity test shall be repaired or replaced by Contractor at no additional cost to Owner.

U. Expose tracer wire at every surface penetration (i.e. valves, hydrants, vaults, etc.). Protect wire ends with wire caps and protect from corrosion. Provide extra length of tracer wire at each structure, so tracer wire can be pulled 3 feet out top of structure for connection to detection equipment.

V. Install underground utility marking tape continuous, buried 18 inches directly above pipe Coordinate with Section 31 23 17 and 31 23 23.

W. Install aboveground utility markers as specified on the Drawings.

X. Install heat trace, if applicable, and pipe insulation on all exposed pipes. Completely seal all insulation with vinyl tape.

3.5 INSTALLATION - TAPPING SLEEVES AND GAUGES

A. Install tapping sleeves and gauges in accordance with Drawings and in accordance with manufacturer's instructions.

3.6 THRUST RESTRAINTS

A. Install tie rods, clamps, setscrew retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.

B. Install thrust blocks or restrained fittings in accordance with Drawings and in accordance with manufacturer's instruction.

C. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.

3.7 BACKFILLING

A. Backfill trenches for piping in accordance with Section 31 23 23.

3.8 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.9 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform pressure test on potable water distribution system in accordance with applicable standards:
   1. PVC Pipe: AWWA C605.

C. Hydrostatic pressure for testing shall be 1.5 times the designed working pressure at the lowest point in the line section being tested, or 150 psi minimum pressure, whichever is greater. In the event it is not possible to measure the pressure at the lowest point directly, this pressure may be calculated by measuring the pressure elsewhere within the section and calculating the pressure based on elevation difference.
   1. Warning: Safety is of paramount importance when conducting hydrostatic pressure leak test due to possibility of sudden violent rupture or failure.
   2. In no case shall the test pressure exceed the manufacturers' recommended maximum safe test pressure for the pipe or fittings.
   3. For all pipe other than HDPE, maintain pressure in the pipeline for 24 hours prior to starting the test, then test the pipeline for 96 hours or until accepted by the Engineer.
   4. No observable leakage is allowed. Measurable leakage must be within the maximum allowable limits set forth by applicable AWWA and ASTM standards.
   5. Any leaks detected during testing shall be repaired. After repairs are completed, another full duration test shall be performed on the section of the pipeline to which the repairs were made.

D. Testing of field welds on steel pipe and fittings shall be by ultrasonic or radiographic method in accordance with AWS D1.1.

1. The Engineer reserves the right to demand evidence of welder's certification for all personnel performing field welding of steel pipe and fittings.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

F. Tolerances: Lay pipe to lines and grades shown on Drawings or as indicated by the Engineer, to the following tolerances:
1. Total departure from vertical grade not to exceed 3 inches.
2. Departure from vertical slope not to exceed 1/16 inch per foot.

G. Contractor shall not connect to existing system until all testing and disinfection is complete and shall obtain written permission from the Owner to proceed with connection to the existing system.

END OF SECTION

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for domestic water service connections to buildings.
2. Corporation stop assembly.
3. Curb stop assembly.
4. Meter setting equipment.
5. Residential water meters.
6. Commercial water meters.
7. Backflow preventers.
8. Pressure reducing valves.
9. Underground pipe markers.
10. Meter cans and vaults.
11. Bedding and cover materials.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods.
2. Section 31 23 17 - Trenching.
3. Section 31 23 23 - Backfill.
4. Section 33 11 00 - Water Utility Distribution Piping.
5. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Water Meter Assemblies:
1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes entire meter assembly: Double strap saddle, corporation stop assembly, pipe and all associated fittings from corporation stop to meter, curb stop assembly (if included in design), meter, meter box, meter setting equipment, fittings and accessories, backflow preventer, pressure reducing valve (if included in design), connection to service line from home or business (if existing), 10 foot polyethylene pipe pig tail from meter (if corresponding home or business is not currently served by the system), excavation, bedding, backfill and disinfection.

1.3 REFERENCES

A. New Mexico Standard Specification for Public Works Construction (NMSSPWC), 1987 edition.
1. NMSSPWC - Section 802 - Installation of Water Service Lines.
2. NMSSPWC - Section 801 - Installation of Water Transmission, Collector, and Distribution Lines.

B. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. American Society of Mechanical Engineers (ASME):
   1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. American Society of Sanitary Engineering (AMSE):
   1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
   2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

E. American Society for Testing and Materials International (ASTM):
   1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
   4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   6. ASTM D1785 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   7. ASTM D2241 - Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
   8. ASTM D2466 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
   9. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
   10. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   11. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

F. American Welding Society (AWS):
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

G. American Water Works Association (AWWA):
   1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   2. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
   3. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
   4. AWWA C800 - Underground Service Line Valves and Fittings.
   5. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
   6. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meters, meter setting equipment, service saddles, backflow preventer, and accessories.

C. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, curb stops (if applicable), connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the most recent edition of New Mexico Standard Specifications for Public Works Construction, with latest revisions.

B. All piping, fittings, valves, and any other service connection appurtenances shall comply with the “Reduction of Lead in Drinking Water Act”, in effect as of 2014, or any subsequent revision thereof.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 00 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

1.8 MAINTENANCE MATERIALS

A. Furnish two (2) meter keys to Owner (required length) for each meter type.

PART 2 PRODUCTS

2.1 WATER PIPING AND FITTINGS

A. Polyethylene (PE) Pressure Pipe: AWWA C901, for Pressure Pipe and Tubing ½" through 3", ASTM D2239 SIDR 7, iron pipe size; or ASTM D2737, SDR 9, copper tubing size:
1. Minimum pressure rating: 200 psi.
2. Fittings: AWWA C901, molded or fabricated.
3. Joints: Compression fittings, compatible with heavy-duty copper service fittings.

2.2 CORPORATION STOP ASSEMBLY

A. Manufacturers (acceptable model numbers as indicated on Drawings):
1. Mueller Company.
2. Ford Company.
3. A.Y. McDonald Manufacturing Co.
4. Or approved equal
5. Substitutions: Section 01 00 00 - Product Requirements.

B. Corporation Stops:
1. Brass or red brass alloy body conforming to ASTM B62.
2. Inlet end threaded for tapping according to AWWA C800.
3. Outlet end suitable for service pipe specified.

C. Service Saddles:
1. Double strap type, designed to hold pressures in excess of pipe working pressure per Technical Specification 33 11 00 Water Utility Distribution Piping.

2.3 CURB STOP ASSEMBLY

A. Manufacturers (acceptable model numbers as indicated on Drawings):
1. Mueller Company.
2. Ford Company.
3. A.Y. McDonald Manufacturing Co.
4. Or approved equal
5. Substitutions: Section 01 00 00 - Product Requirements.

B. Curb Stops:
1. Brass or red brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.

C. Curb Boxes and Covers:
1. Cast iron body, Extension Type or Buffalo Type.
2. Minneapolis or Arch Pattern Base.
3. Lid with inscription WATER, with Pentagon Plug.

2.4 METER SETTING EQUIPMENT

A. Manufacturers:
1. Mueller Company.
2. Ford Company.
3. A.Y. McDonald Manufacturing Co.
4. Or approved equal
5. Substitutions: Section 01 00 00 - Product Requirements.

B. Meter Setter Assemblies:
1. Horizontal inlet and outlet.
2. Ball Angle Meter Valve w/ lockwing on inlet.
3. ASSE 1024 Approved Vertical Double Check Valve on outlet.
4. Meter setter depth per Drawings.
5. Include drain/test valve on meter setter assembly on outlet, either incorporated in check valve or separate [as indicated on Drawings].

2.5 RESIDENTIAL WATER METERS

A. Manufacturers (acceptable model numbers as indicated on Drawings):
1. Neptune Mach 10
2. Or approved equal
3. Substitutions: Section 01 00 00 - Product Requirements.

B. 5/8” x 3/4”

2.6 COMMERCIAL WATER METERS
1. Not used.

2.7 BACKFLOW PREVENTERS
1. Not used.

2.8 PRESSURE REDUCING VALVES

A. Manufacturers
1. Watts Industries Series 25AUB
2. Zurn Wilkins Model 600 XL
3. Approved equal

B. 3/4 inch FIPT

C. 25 to 75 psi range

D. Minimum 7-inch horizontal clearance between PRV and Meter.
1.

2.9 UNDERGROUND PIPE MARKERS:

A. Underground Pipe Markers: Conform to Section 33 11 00.

2.10 METER CANS AND VAULTS:

A. Meter can and meter vault specifications:
1. Can, cover, and lid shall be rated for a load capacity of 5,000 lbs over a 10" x 10" area.
2. Maximum wall deflection shall not exceed $^1/_8$" at any one point when subtracted from earth pressures or forces created during backfilling.
3. The material used for making the can or vault shall be non-biodegradable and corrosion-proof when buried underground and exposed to water.
4. The minimum dimensions of the can, cover and lid shall conform to the Standard Detail Drawings.
5. A 3" x 3" pipe hole shall be located at the bottom ends of the can.
6. The walls inside and outside of the can shall be reasonably smooth and free of burrs.
7. Cover of the meter can or vault must have a non-skid surface and have "WATER METER" inscribed on the top. The cover shall be secured to the can or vault by a bolt.
8. The 11½" frost lid and entrance lid shall be centered in the cover.
9. The material used for manufacturing the can, cover and lid shall be new and shall be suitable for service in ambient temperatures from negative (-) 20°F to 120°F: nominal material compressive strength = 11,000 psi, nominal material tensile strength = 1,700 psi, and nominal material flexural strength = 7,500 psi.

B. Supplemental residential meter can specifications:
1. The meter can is to be part of an underground enclosure for 3/4 inch water meters.
2. The overall weight of the can, cover, and lid and extension shall not exceed 150 lbs.

2.11 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 23 23.

B. Cover: Fill Type as specified in Section 31 23 23.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type as specified in Section 31 23 23. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.12 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 05 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify building service connection and municipal utility water main size, location, and invert elevation are as indicated on Drawings.

C. Water meter assemblies shall be installed at the locations indicated by the Owner's Representative. The Owner's Representative will identify location of existing system components and assist the Contractor with location and verification of the existing system in the field.

3.2 PREPARATION

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

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION - CORPORATION STOP ASSEMBLY

A. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the Engineer.

B. Provide service clamps for mains other than of cast iron or ductile iron mains.

C. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12 inches apart longitudinally and staggered.

D. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.

E. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by the Engineer.

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to 95 percent.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sewer piping in accordance with New Mexico Public Work Standards.

B. Group piping with other site piping work whenever practical.

C. Route pipe in straight line, as much as possible. Do not crimp polyethylene pipe during installation or at any other time.

D. Copper tubing shall be bent with approved tube benders without any kinks or sharp bends. Cutting of tubing will be performed with cutters designed for that purpose.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints.

F. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

G. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

H. Establish elevations of buried piping with not less than 4 ft of cover. Install tracer wire continuous, taped to top of pipe at regular intervals not exceeding 24", and plastic warning tape directly above buried piping, all in accordance with Section 33 11 00. Coordinate with Sections 31 23 17 and 31 23 23. Contractor shall test tracer wire for continuity periodically when instructed by Engineer, and prior to final acceptance of work.

I. Backfill trench in accordance with Section 31 23 23.

3.6 INSTALLATION - CURB STOP ASSEMBLY

A. Set curb stops on solid bearing.

B. Center and plumb curb box over curb stops. Set box cover flush with finished grade.

3.7 INSTALLATION - WATER METERS

A. Install positive displacement meters in accordance with AWWA M6, and the following sections of the New Mexico Standard Specifications for Public Works Construction (NMSSPWC), in total or in part, except where amended by these Technical Specifications.
   1. Section 801 - Installation of Water Transmission, Collector, and Distribution Lines.
   2. Section 802 - Installation of Water Service Lines.

3.8 INSTALLATION - BACKFLOW PREVENTERS

A. Install backflow preventer where indicated on the Contract Drawings and in accordance with manufacturer's instructions.

B. Comply with local water company requirements and plumbing codes in regards to testing and installation requirements.

3.9 SERVICE CONNECTIONS

A. Install water service in accordance with utility company requirements with double check valve backflow preventer and water meter in meter box.

B. Connect water meter assembly to existing service line from each home or business. If no service line exists from the corresponding home or business to be served by the new meter assembly, leave a 10-foot length of polyethylene pipe at the outlet side of the meter assembly, unless otherwise indicated on the Drawings.

C. Install Work in accordance with the most recent edition of New Mexico Standard Specifications for Public Works Construction, with latest revisions.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.11 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. During testing of the materials at the above ambient temperatures, no visual cracking, checking, blistering, surface pitting or deformation shall be noted.

C. Perform pressure test on domestic site water distribution system in accordance with AWWA C600. Compaction Testing for Bedding: In accordance with ASTM D1557.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Compaction testing shall be done to the extent such that the Owner and Engineer can be reasonably assured that the backfill has been placed in accordance with the requirements of the Contract Documents. When a testing allowance is established on the Bid Form, the Owner and Engineer will determine the testing frequency to be used throughout the project. If no allowance is included, the frequency of testing shall be at least once every 400 linear feet of trenching.

END OF SECTION

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Gate Valves.
2. Ball Valves.
3. Pressure Reducing Valves.
4. Combination Air Valves.
5. Water Pressure Gauges.
6. Valve boxes.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 23 - Backfill.
4. Section 33 05 16.13 - Precast Concrete Utility Structures.
5. Section 33 11 00 - Water Utility Distribution Piping.
6. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Valves:
1. Basis of Measurement: Each.
2. Basis of Payment: Includes excavation, valve, valve box, valve riser and collar, accessories, tests, backfill and compaction.

B. Pressure Reducing Valve Assemblies:
1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes excavation, vault, pressure reducing valve, fittings and accessories, backfill and compaction.

C. Check Valve Assemblies:
1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes excavation, vault, check valve, fittings and accessories, backfill and compaction.

D. Combination Air Valves:
1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes excavation, vault, combination air valve, fittings, accessories, backfill and compaction.

1.3 REFERENCES

A. American Water Works Association (AWWA):

1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
2. AWWA C504 - Rubber-Seated Butterfly Valves.
3. AWWA C508 - Swing-Check Valves for Waterworks Service, 2- through 24-in.
4. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
5. AWWA C515 - Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service.
6. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

B. National Sanitation Foundation (NSF):
1. NSF/ANSI Standard 61 - Drinking Water Components - Health Effects.

C. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
1. 801 - Installation of Water Transmission, Collector, and Distribution Lines.
2. 802 - Installation of Water Service Lines.

1.4 SUBMITTALS

A. Design Data: Submit manufacturer's latest published literature. Include illustrations, installation instructions, maintenance instructions and parts lists.

B. Manufacturer’s Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that valves and accessories provided meet or exceed AWWA Standards and specification requirements.

C. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of all valves. Provide completed Water Valve Cards for each valve installed per NMSSPWC Section 801.4.

B. Provide Operation and Maintenance Data for each type of valve installed.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable New Mexico Standards and the National Fire Protection Act (NFPA).

B. All piping, fittings, valves and any other potable water system appurtenances shall comply with the “Reduction of Lead in Drinking Water Act”, in effect as of 2014, or any subsequent revision thereof.

C. Valves: Mark valve body with manufacturer's name and pressure rating.

1.7 QUALIFICATIONS

A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum three years’ experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Prepare valves and accessories for shipment according to AWWA Standards and seal valve ends to prevent entry of foreign matter into product body.

B. Deliver and store valves in shipping containers with labeling in place.

C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

D. Coated valves and appurtenances shall be shipped on bunks and secured with nylon belt tie down straps or padded banding over braces, and shall be stored on padded skids or other suitable means to prevent damage to coating.

E. Coated valves shall be handled with wide belt slings, padded forks or other means to prevent damage to coating. Chains, cables or other equipment likely to damage coating or valves shall not be used.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.10 COORDINATION

A. Coordinate work with community of Regina, the local fire department, and utilities within construction area.

1.11 MAINTENANCE MATERIALS

A. Furnish two (2) tee wrenches to Owner (required length) for each valve type.

PART 2 PRODUCTS

2.1 GENERAL

A. All equipment that comes in contact with either potable water or products that support the production of potable water must comply with NSF/ANSI Standard 61 as available.

2.2 RESILIENT WEDGE GATE VALVES

A. Manufacturers:
1. American Flow Control, Series 2500
2. American AVK, Series 45
3. East Jordan Iron Works, FlowMaster
4. J&S Valve, Model 6800 and 6900
5. Kennedy

6. Mueller Company
7. Southern Valve and Fitting USA Inc., Series 801 and 806
8. United Water Products, Model 2010
9. US Pipe, MetroSeal
10. Or approved equal
11. Substitutions: Section 01 00 00 – Product Requirements.

B. Resilient Wedge Gate Valves: AWWA C509/C515, NSF 61.
1. Body, Bonnet, Gland Flange and Stuffing Box: Gray Iron or Ductile Iron for valves meeting AWWA C509, and Ductile Iron for valves meeting AWWA C515.
2. Stem and Stem Nut: Low Zinc (<15%) Bronze or Stainless Steel.
   a. Stem: Non-rising stem (NRS), Minimum yield strength of 40,000 psi and elongation of 12%.
   b. Stem Nut: Minimum yield strength of 30,000 psi.
3. Wedge: Ductile Iron ASTM A536 fully encapsulated with rubber.
4. Bolts and Nuts: Stainless Steel.
5. Operating Nut: Square; open counterclockwise unless otherwise indicated.
6. Ends: Flanged or mechanical joint as directed by the Engineer.
7. Coating: Fusion bonded epoxy conforming to AWWA C550; interior/exterior.
8. Sizes 12 inch diameter and smaller: 250 psig.
9. Sizes 16 inch diameter and larger: 200 psig.

C. Where waterline is buried at a depth greater than 4 feet, provide valve stem extensions, complete with extension stem stabilizers, until depth of extension nut at least matches depth of operating nuts on valves installed at four-foot depth.

2.3 BALL VALVES

A. Manufacturers:
1. Milwaukee Valve.
2. Apollo
3. Red White Valve Corp.
4. Stockham
5. Substitutions: Section 01 00 00 - Product Requirements.

B. All ball valves 2-inch or smaller shall be stainless steel.

C. May be imported or domestic.

D. Working Pressure: Not less than 350 psi.

E. Inlet/Outlet: NPT, or as shown on Drawings.

F. All stainless steel construction, including body, tailpiece, ball, ball retainer, stem, handle, handle nut, packing nut, and lock washer.

G. Valve shall be actuated manually using lever-type handle, one-quarter turn to open and close. Handle length and range of motion shall allow handle to be located in most accessible location without interference with any other object.

2.4 PRESSURE REDUCING VALVE ASSEMBLIES

A. Manufacturers:
1. 4-inch Pressure Reducing Valve: Cla-Val, Model 90-99 G F B Y V KC
2. 2-inch Pressure Relief Valve: Cla-Val, Model 50-01 G F
3. 4-inch Strainer: Cla-Val, Model X43H
4. Restrained Dismantling Joint: Romac DJ400-06
5. 2” Flanged Rubber Check Valve: Tideflex
6. Pressure Gauge: Ashcroft 1010
7. Or approved equal
8. Substitutions: Section 01 00 00 - Product Requirements.

B. Refer to Standard Detail in Plan set for dimensions and specifications for concrete vault that houses the unit.

C. Valve Trim: Stainless steel

D. Valve Pilot system: Stainless steel

E. Each valve assembly shall include:
1. One (1) pressure reducing valve assembly capable of:
   a. Max Continuous Flow as shown in Table below.
   b. Max Intermittent Flow as shown in Table below.
   c. 30 to 300 psi adjustment range

Size (in.)	Max. Continuous Flow (gpm)	Max. Intermittent Flow (gpm)
1.5	125	160
2	210	260
3	460	580
4	800	990
6	1800	2250
8	3100	3900
10	4900	6150

2. One (1) pressure relief assembly with valve sized as shown in Drawings
3. Each PRV assembly with appropriate unions, tees, spigots, gate valves, isolation valves, pressure gauges, etc., as shown in the Standard Detail Drawing.
4. The pressure gauge shall be 4 1/2" diameter face stem mounted type suitable for water 0-200 psi. The gauge shall be connected to the water line as depicted in the Drawings. The gauges shall be oriented towards the manhole opening such that they can be read without entering the manhole.

F. Contractor must construct the above according to most recent edition of the New Mexico Standard Specifications for Public Works Construction, with latest revisions.

G. Piping in vault shall be flanged ductile iron or galvanized, as shown in Drawings.

H. Supply 25 feet of garden hose to connect to water source.

2.5 COMBINATION AIR VALVES

A. Manufacturers:
1. APCO Willamette Valve and Primer Corporation.
2. A.R.I. Flow Control Accessories, Ltd.
3. Danfoss Flowmatic.
4. Val-Matic.
5. Or approved equal
6. Substitutions: Section 01 00 00 - Product Requirements.

B. Valve to perform function of both air release and air/vacuum valves, and be furnished as a single body or dual body type. Valve shall conform to AWWA C512.
1. Air/vacuum valve orifice: As indicated in Drawings
2. Air release valve orifice size: 3/32”

C. Working pressure for all air valve assembly wetted components shall be not less than the working pressure rating of the pipe on which they are installed.

D. Air valve assemblies must be rated to withstand working, test and surge pressures.
1. Surge pressure: 350 psi

E. Cast iron body, cover and baffle; stainless steel trim and float.
1. Seat: Acrylonitrile-Butadiene (NBR).
2. 3" and smaller: NPT threaded outlet.
3. 4" and larger: Plain outlet with steel protector hood

F. Coating: Fusion bonded epoxy conforming to AWWA C550 and NSF 61; interior/exterior.

2.6 VALVE BOXES

A. Manufacturers:
1. East Jordan Iron Works.
2. Tyler Pipe.
3. DL Foundry.
4. SIP Industries.
5. Or approved equal
6. Substitutions: Section 01 00 00 – Product Requirements.

B. 12-inch diameter Valves and Smaller: Domestic cast iron, two-piece, screw type.

C. Valves larger than 12-inch diameter: Domestic cast iron, three-piece, screw type; round base.

D. Where waterline is buried at a depth greater than 4 feet, provide valve box extensions as required.

E. Cast iron lid marked "Water".

2.7 ACCESSORIES

A. Joint Restraints: “EBAA Iron, Megalug®”, or approved equal, for all pipe 4” diameter and greater, “EBAA Iron, Series 6500 and 7500”, or approved equal, for all pipe from 2” to 3-1/2” diameter, installation and spacing as per manufacturer's specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Determine exact location and size of valves from Drawings; obtain clarification and directions from Engineer prior to execution of work.

B. Verify invert elevations prior to excavation and installation of valves.

3.2 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify, and protect utilities to remain from damage.

C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
1. Notify Engineer not less than 48 hours in advance of proposed utility interruption.
2. Do not proceed without written permission from the Engineer.

D. Perform trench excavation, backfilling and compaction in accordance with Sections 31 23 17 and 31 23 23.

3.3 INSTALLATION

A. Gate Valves and Butterfly Valves:
1. Install valves in conjunction with pipe laying; set valves plumb.
2. Provide buried valves with valve boxes installed flush with finished grade.
3. Install valve stem risers and collars, and valve box extensions as required to match finished grade.
4. All valve boxes must be centered over the operating nut. When valve key in use, key shall be centered in valve box.
5. Valves shall require the same joint restraint lengths as dead-ends of similar size and pipe material.
6. All buried metallic components shall be wrapped in 8-mil polyethylene.

B. Specialty Valves and Gauges:
1. Install pressure reducing valves, check valves, solenoid valves, altitude valves, combination air valves, and gauges in accordance with Drawings and in accordance with manufacturer’s instructions, and the following sections of

NNMSSPWC, in total or in part, except where amended by these Technical Specifications:

a. Section 801 – Installation of Water Transmission, Collector, and Distribution Lines.
b. Section 802 – Installation of Water Service Lines.

C. Combination Air Valves:

1. Install valves at locations verified by Engineer. Valves shall be installed at system high points in the vertical position with the inlet down.
2. Provide precast concrete or PVC vault with concrete collar to match finished grade.
3. If unforeseen field conditions arise which necessitate the installation of additional air release valves, such valves shall be installed as directed by the Engineer.
   a. Additional air valves required due to unforeseen field conditions not the fault of the Contractor shall be paid for at established unit prices.
   b. Additional air valves required due to high points caused through fault of the Contractor shall be provided at no additional cost to the Owner.

A. Tracer Wire:

1. For direct buried valves, tape tracer wire to outside of valve box up to last section of box. Bring tracer wire into the valve box above the operating nut. Protect wire ends with wire caps and protect from corrosion. Provide extra length of tracer wire at each structure, so tracer wire can be pulled 3 feet out top of structure for connection to detection equipment

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.5 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform pressure test on domestic site water distribution system in accordance with AWWA C605.

C. All valves, including butterfly valves, gate valves, check valves and air valves shall be manually actuated through their full cycle to ensure proper operation prior to installation.

END OF SECTION

SECTION 33 12 19

HYDRANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire hydrants.
2. Flush hydrants.
3. Yard hydrants.

B. Related Sections:
1. Section 03 05 00 - Basic Concrete Materials and Methods.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 23 - Backfill.
4. Section 33 11 00 - Water Utility Distribution Piping.
5. Section 33 12 13 - Water Service Connections.
6. Section 33 12 16 - Water Utility Distribution Valves.
7. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fire and Flush Hydrants Assemblies:
1. Basis of Measurement: Each.
2. Basis of Payment: Includes complete installation as shown in the standard detail: excavation, tee on mainline, waterline between tee and gate valve and between the gate valve and hydrant, hydrant, gate valve, valve riser and collar, all associated MJ fittings, thrust block installation or megalugs, gravel for drain, all other fittings and accessories necessary for a complete installation, and testing and backfill.
3. These items, along with their corresponding MJ fittings and megalugs, shall be paid for out of the corresponding bid item.

1.3 REFERENCES

A. American Water Works Association (AWWA):
1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
2. AWWA C502 - Dry-Barrel Fire Hydrants.
3. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

B. National Sanitation Foundation (NSF):
1. NSF/ANSI Standard 61 - Drinking Water Components - Health Effects.

C. National Fire Protection Association (NFPA):
1. NFPA 291 - Recommended Practice for Fire Flow Testing and Marking Hydrants.

D. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
   1. 801 - Installation of Water Transmission, Collector and Distribution Lines.
   2. 802 - Installation of Water Service Lines.

1.4 SUBMITTALS

A. Design Data: Submit manufacturer's latest published literature. Include illustrations, installation instructions, maintenance instructions and parts lists.

B. Manufacturer’s Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that valves, hydrants, and accessories provided meet or exceed AWWA Standards and specification requirements.

C. All articles, materials, and supplies that are consumed in, incorporated into, or permanently affixed must comply with Build America, Buy America Act (BABAA) requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of hydrants. Provide completed Fire Hydrant Data Cards for each valve installed per NMSSPWC Section 801.5.

B. Provide Operation and Maintenance Data for hydrants.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable New Mexico Standards and the National Fire Protection Act (NFPA).

B. Provide uniform color scheme for fire hydrants in accordance with NFPA 291.

1.7 QUALIFICATIONS

A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum three years experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Prepare valves, hydrants and accessories for shipment according to AWWA Standards and seal valve, hydrant and ends to prevent entry of foreign matter into product body.

B. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.10 COORDINATION

A. Coordinate work with the community of Regina, the local fire department, and utilities within construction area.

1.11 MAINTENANCE MATERIALS

A. Furnish two (2) hydrant wrenches to Owner for each hydrant type.

PART 2 PRODUCTS

2.1 FIRE HYDRANTS

A. Fire hydrant assembly includes the tee off the mainline, waterline between the tee and gate valve, gate valve, valve box, waterline between the valve and hydrant, fire hydrant, and all appurtenances including fittings, thrust blocking and joint restraints required for a complete installation, as indicated on the design drawings. The waterline material used must match that called for in Section 33 11 00.

B. Manufacturers:
1. Clow Medallion
2. Or approved equal
3. Substitutions: Only with prior approval of Engineer.

C. Dry-barrel Break-away Type: AWWA C502; cast-iron body, compression type valve.
1. Bury Depth: As indicated on the Drawings.
2. Inlet Connection: 6 inches.
3. Main Valve Opening: 5-1/4 inches diameter minimum.
4. Ends: Mechanical Joint or Bell End.
5. Bolts and Nuts: Corrosion resistant.
6. Coating: AWWA C550; interior.
7. Direction of Opening: Counterclockwise unless otherwise indicated.

D. One pumper, two hose nozzles.
1. Obtain thread type and size from local fire department.
2. Attach nozzle caps by separate chains.

E. Finish: Primer and two coats of enamel, color in accordance with fire department requirements.

F. Final selection of fire hydrant to be coordinated with local fire department for consistency with existing operating and emergency equipment.

2.2 ACCESSORIES

A. Joint Restraints: “EBAA Iron, Megalug®”, or approved equal, for all pipe 4” diameter and greater, “EBAA Iron, Series 6500 and 7500”, or approved equal, for all pipe from 2” to 3-1/2” diameter, installation and spacing as per manufacturer's specifications.

B. Concrete for Thrust Restraints: Concrete type specified in Section 03 05 00.

C. Aggregate: Aggregate for hydrant drainage specified on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Determine exact location and size of valves and hydrants from Drawings; obtain clarification and directions from Engineer prior to execution of work.

B. Verify invert elevations prior to excavation and installation of valves and hydrants.

3.2 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify, and protect utilities to remain from damage.

C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
1. Notify Engineer not less than 48 hours in advance of proposed utility interruption.
2. Do not proceed without written permission from the Engineer.

D. Perform trench excavation, backfilling and compaction in accordance with Sections 31 23 17 and 31 23 23.

3.3 INSTALLATION

A. Install hydrants in accordance with Drawings, manufacturer's instructions, and the following sections of NNMSSPWC, in total or in part, except where amended by these Technical Specifications:
1. Section 801 - Installation of Water Transmission, Collector, and Distribution Lines.
2. Section 802 - Installation of Water Service Lines.

B. Fire and Flush Hydrants:
1. Install hydrants; provide support blocking and drainage gravel; do not block drain hole.
2. Set hydrants plumb with pumper nozzle facing roadway; set hydrants with centerline of pumper nozzle 18 inches above finished grade and safety flange not more than 6 inches or less than 2 inches above grade.
3. Fire hydrant locations shall be no further than 10 feet from the edge of the approved access roadways with the steamer connections facing towards the driving surface. Final placement of the fire hydrants shall be coordinated and approved by the Owner prior to installation.
4. Final fire hydrant locations shall be located in full view for incoming emergency responders. Landscape vegetation, utility pedestals, walls, fences, poles, and the

like shall not be located within a three foot radius of the hydrant per Article 10, Sections 1001.7.1 and 1001.7.2 of the 1997 Uniform Fire Code.

5. Fire hydrants subject to possible vehicular damage shall be adequately protected with guard posts in accordance with Section 8001.11.3 of the 1997 Uniform Fire Code.
6. Paint hydrants in accordance with local color scheme.
7. After hydrostatic testing, flush hydrants and check for proper drainage.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.5 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform pressure test on domestic site water distribution system in accordance with AWWA C605.

END OF SECTION

SECTION 33 13 00

DISINFECTION OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution and transmission system; and testing and reporting results.

B. Related Sections:
1. Section 33 11 00 - Water Utility Distribution Piping
2. Section 33 12 13 - Water Service Connections.
3. Section 33 12 16 - Water Utility Distribution Valves

1.2 REFERENCES

A. American Water Works Association (AWWA):
1. AWWA B300 - Hypochlorites.
2. AWWA B301 - Liquid Chlorine.
3. AWWA B302 - Ammonium Sulfate.
4. AWWA B303 - Sodium Chlorite.
5. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
6. AWWA C651 - Disinfecting Water Mains.

B. National Sanitation Foundation (NSF):
1. NSF-60 - Drinking Water Treatment Chemicals - Health Effects.

C. New Mexico Administrative Code (NMAC) - Title 20, Chapter 7, Part 10:
1. Section 201: Application for Public Water System Project Approval.
2. Section 400: General Operating Requirements.

1.3 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

C. Testing Plan: Contractor must submit proposed testing procedures specific to the project including laboratory name and contact information, testing/sampling locations, method for disposal of chlorinated water and equipment to be employed for disinfection for approval by Engineer.

D. Test Reports: Indicate results comparative to specified requirements.

E. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Disinfection Report:
1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.

D. Water Quality Certificate: Certify water conforms to quality standards of authority having jurisdiction, suitable for human consumption.

E. The Contractor shall sign an Affidavit, which they will have notarized, certifying that disinfection of the water facilities constructed was completed according to AWWA C-654. The Affidavit shall include the Contractor’s name, title, signature, as well as the date of disinfection and the project name.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

1.6 QUALIFICATIONS

A. Testing Firm: Company specializing in testing potable water systems, certified by State of New Mexico.

B. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. All products added directly to water for purposes of disinfection shall conform to NSF/ANSI Standard 60.

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

C. Per NMSSPWC Section 801.17.1, “Dry chlorine will not be used for disinfection of waterlines.”

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Prior to disinfection, thoroughly flush the system with potable, disinfected water. Flushing may be accomplished either by gravity or by pumping, provided the pump is not damaged due to insufficient head. Any damage to the pump during flushing shall be the responsibility of the Contractor and shall be repaired or replaced at no additional expense to the Owner. A minimum flow velocity of 3 feet per second (fps) is required, or as otherwise approved by Engineer.

B. Provide and attach required equipment to perform the Work of this section.
1. Contractor shall install testing saddles, if needed, to comply with spacing requirements for bacteriological testing under AWWA C651. Such testing saddles are not shown on the drawings; the associated material and installation cost shall be considered incidental to the project.

C. Introduce treatment into piping system and perform disinfection in accordance with AWWA C651.

D. Maintain disinfectant in system for 24 hours, or 48 hours if the temperature is less than 41 degrees Fahrenheit.”

E. Flush, circulate, and clean using domestic water.
1. Contractor shall coordinate with Owner Representative prior to using domestic water to avoid interruption of service to existing connections. Contractor shall not

exceed maximum allowable instantaneous flow (gpm) or daily flow (gpd), as specified by the Engineer.

F. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Disinfection, Flushing, and Sampling:
1. Disinfect and test pipeline installation in accordance with AWWA C651.
2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory, approved by the Engineer, to sample, test and certify water quality suitable for human consumption, in accordance with AWWA C651.
   a. Per AWWA C651 Sec. 5.1, two samples taken are required at each sampling location. See C651 for details.
   b. For new mains, sets of samples shall be collected every 1,200 ft of the new water main, plus one set from the end of the line and at least one from each branch greater than one pipe length.
   c. If trench water has entered the new main during construction or if, in the opinion of the Engineer, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft, and the sampling location shall be identified Samples shall be taken of water that has stood in the new main for at least 16 hr after final flushing has been completed.
5. Contractor shall be reimbursed for the cost of laboratory tests upon submittal of invoice(s). The laboratory results of all tests shall be submitted directly to the Engineer. Contractor shall pay for all failed tests.
6. Contractor shall not connect to existing system until all testing and disinfection is complete and shall obtain written permission from the Engineer to proceed with connection to the existing system.

C. Re-Disinfection:
1. In the event the performed water quality testing fails, the Contractor will disinfect the affected portions of the system again, and the approved testing laboratory shall sample, test and certify water quality as described in these specifications. Re-disinfection shall be performed at no additional cost to the Owner.

END OF SECTION