

SANTA FE COUNTY

ANTONIO LANE SEWER UPGRADE PROJECT

Project Manual for 100% Design Submittal
Including Specifications for Construction

AUGUST 2019

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The technical material and data contained in the specifications were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

(SEAL)



Richard A. Morris

N.M.P.E. No. 14510

All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 specification sections, apply to work of this Section.

1.02 DESCRIPTION

- A. This project consists of installation of approximately 543 linear feet of 10-inch SDR26 and 147 linear feet of 10-inch PVC C-900 sanitary sewer line with manholes and service stub outs, connecting to an existing sanitary sewer line in Agua Fria Street, via an existing stub out at the intersection of Agua Fria and Antonio Lane. There will also be approximately 630 linear feet of 2-inch low pressure sewer line including all appurtenances. Installation of approximately 1305 linear feet of 8-inch waterline to replace existing 2-inch water line currently serving existing residences. The pipeline installation shall connect into an existing 8-inch line in two locations located in Agua Fria Street and at the southern end of Antonio Lane in the vicinity of an existing fire hydrant. Construction will also include all appurtenances, including but not limited to sanitary sewer manholes, service laterals for future connection by residents, air release valves, fire hydrants, water valves and water meter cans. There will be many areas where there could be potential conflicts with existing utility lines, including water, gas, communication and other underground utilities. All work located in the historic village of Agua Fria in Santa Fe County along Antonio Lane. New construction will be within existing roads on private property with Sanitary Sewer easements and Santa Fe County owned land .

1.03 THE WORK

- A. Base Bid Clarification: The Base Bid includes all elements of construction shown for the complete and operational construction of this project.

1.04 SUMMARY BY REFERENCES

- A. Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, Addenda and Modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomena, including weather conditions, and other forces outside the Contract Documents.

1.04 CONTRACTOR USE OF THE PREMISES

- A. The immediate premises of work will be at the disposal of the Contractor during the construction period.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 02

UTILITY OBSTRUCTIONS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. General provisions for handling utility obstructions and relocations.

1.02 UTILITIES SHOWN ON DRAWINGS

- A. The Engineer has made reasonable effort to show the general location of existing underground and overhead utility lines on the Drawings.
- B. The Contractor shall recognize that when working in the project area or along an existing road, utilities may not be in the locations shown on the Drawings. Likewise, there may be utilities in locations other than that shown on the Drawings. The Contractor is required to:

1. Perform potholing to verify existing utility locations, whether identified on the Drawings or not, prior to construction.
2. Repair any damage to existing utilities caused by Contractor.

- C. This work will be considered incidental to the Work.

1.03 RELOCATION OF OVERHEAD UTILITIES

- A. Determine in advance of construction operations if overhead utility lines, support structures, poles, guys, etc., whether shown on the Drawings or not, will obstruct construction operations. If any obstruction to construction operations is evident, coordinate with the appropriate utility company to remove or relocate the utility obstructions. Any charges by any utility company for removal or relocation of overhead utilities are the sole responsibility of the Contractor at no additional cost to the Owner.

1.04 RELOCATION OF UNDERGROUND UTILITIES

- A. Determine in advance of construction operations locations of all underground utilities (gas, telephone, electrical, cable TV, water, sewer), whether shown on the Drawings or not, that may interfere with Contractor's construction operations.

B. All Underground Utilities: Coordinate with the appropriate utility company to remove or relocate the existing utilities which interfere with construction.

C. Water and Sewer Lines:

1. Adjust alignment on waterline which Contractor is constructing to avoid existing underground utility lines. Take other measures necessary (encasement of water or sewer line, change of pipe material, etc.) to protect new and existing lines.
2. Adjust alignment of all existing waterlines as appropriate or required to avoid interference with:
 - a. new sewer lines, or;
 - b. new structures, or;
 - c. new roadway, or;
 - d. to maintain at least three feet of cover over existing waterlines unless otherwise approved in writing by Engineer.

D. Incidental work to be performed at no additional cost to Owner: All work required to adjust alignment of new waterlines around any existing waterlines or sewer lines, or other measures necessary to protect new and existing lines.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 03

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 APPLICABLE CODES AND ORDINANCES

- A. All Work shall conform to the current versions of all applicable building, plumbing, mechanical, and electrical codes.
- B. Contractor is responsible for acquiring all applicable building permits related to this project.
- C. Comply with all local laws, ordinances, and regulations which may impact Contractor's work.

1.02 OSHA REQUIREMENTS

- A. All work, equipment, and facilities provided, including but not limited to, handrails, guardrails, grating, hoists, equipment guards, ladders, etc., shall meet OSHA requirements whether or not such requirements are specifically indicated or described in the Contract Documents.
- B. Any conflicts between OSHA requirements and Contract Documents shall be brought to the attention of the Engineer on a timely basis for resolution.

END OF SECTION

SECTION 01 14 16.01

COORDINATION WITH PUBLIC AND UTILITY INTERRUPTIONS

PART 1 GENERAL

1.01 PUBLIC ACCESS

- A. Provide for continuous public access to all residences, businesses, and properties via existing roads, alleys, and driveways whenever practical.
- B. Provide alternate public access to all residences, businesses, and properties in coordination with affected residents and occupants when existing access arrangements must be disrupted by Contractor's work whenever practical.
- C. Notify public at least three (3) calendar days in advance of interrupting public access.

1.02 UTILITY INTERRUPTIONS

- A. Coordinate any water shut-off operation with the Owner not less than three (3) working days prior to initiating any work affecting existing water utilities. Limit water service shut-off to four (4) hours. Keep Owner informed of work areas on a daily basis, and specifically notify Owner of areas where fire hydrants will be out of service.
- B. Notify all customers at least three (3) calendar days in advance of interrupting utility service.
- C. Keep interruptions of utility service at a minimum as to number of users and duration.

1.03 NOTICES

- A. Construction Notices Before Construction:
 - 1. Delivered not more than seven (7) calendar days nor less than four (4) calendar days prior to actual physical construction on each line or line segment.
 - 2. Corrected notices delivered if construction does not start within 48 hours of date given in notice.
 - 3. Written notice to state:
 - a. Contractor's name, address, and local telephone number.
 - b. Nature of work to be done.
 - c. Disruption residents or businesses might expect.
 - d. Expected duration of construction.

- e. Contractor's local telephone number to which complaints may be made during normal working hours.
Contractor's local telephone number to which emergency conditions can be reported during non-working periods.

B. Construction Notices After Construction:

- 1. Delivered not more than seven (7) calendar days following construction on each line or line segment.
- 2. Written notice to state:
 - a. Contractor's name, address, and telephone number.
 - b. Thank residents and businesses for cooperation and report work is completed in applicable area.

C. Special Notices:

- 1. Inform residents and businesses personally and by written notice whenever access to property will be impaired or utility service will be interrupted, stating scheduling of such action.

D. Notice Delivery:

- 1. Hand deliver to each resident and business adjacent to or which may reasonably expected to be affected by construction.

1.04 SCHEDULE OF SPECIAL REQUIREMENTS FOR THIS PROJECT

- A. Provide all notices included above.

END OF SECTION

SECTION 01 14 19

USE OF SITE

PART 1 GENERAL

1.01 AVAILABLE SITES

- A. Sites and easement limits available for the construction of the project are shown on the Drawings. Contractor shall not utilize any land not indicated as being available without the written approval of the applicable land owner.
- B. If the Contractor requires the entire width of right-of-way or easement of construction, it shall be the Contractor's responsibility to have a licensed land surveyor establish the easement or right-of-way line where it is not apparent.

1.02 PROTECTION AND RESTORATION

- A. All existing features and improvements to or on easements shall be restored by the Contractor equivalent to those existing prior to construction at no additional cost to the Owner. Compliance with special requirements or considerations indicated on the Drawings for use of easements shall be the Contractor's responsibility at no additional cost to the Owner.
- B. Trees within construction easement shall be preserved to maximum practical extent, unless specifically indicated in the Drawings.

1.03 SPECIAL CONSTRUCTION METHODS

- A. Special and hand construction methods may be required to remain within the available easements. Such methods shall be used by the Contractor at no additional cost to the Owner.

1.04 STAGING SITES

- A. There is no area available within the public right-of-way for a staging site. The Contractor may elect on his own to use private property for this purpose. See Section 01 52 13 – Field Offices, Sheds, and Staging Site.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. For the purposes of this Specification Section, the terms "material and equipment" and "Products" have the same meaning and are used interchangeably.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract

1.03 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Contractor's Options:
 - 1. For Products specified only by reference standard, select any product meeting that standard.
 - 2. For Products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
 - 3. For Products specified by naming one or more Products or manufacturers and "or equal" or similar term, Contractor shall submit a request as for substitutions for any Product or manufacturer not specifically named.
 - 4. For Products specified by naming only one Product and manufacturer, there is no option.
- B. Substitutions:
 - 1. For a period of 30 days after the Preconstruction Conference, Engineer will consider written requests from Contractor for substitution of Products.
 - 2. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
 - a. Comparison of the qualities of the proposed substitution with that specified.
 - b. Changes required in other elements of the work because of the substitution.
 - c. Effect on the construction schedule.
 - d. Cost data comparing the proposed substitution with the Product specified.
 - e. Any required license fees or royalties.
 - f. Availability of maintenance service, and source of replacement materials.

3. Engineer shall be the judge of the acceptability of the proposed Product substitution.

C. Contractor's Representation

1. A request for a Product substitution constitutes a representation that Contractor:
 - a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
 - b. Will provide the same warranties or bonds for the substitution as for the Product specified.
 - c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
 - d. Waives all claims for additional costs or contract time, under his responsibility, which may subsequently become apparent.

- D. Engineer will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

1.04 INTENT OF TECHNICAL SPECIFICATIONS

- A. Since the specified materials and details of equipment and component fabrication and assembly are given for specific functional, operational, maintainability, and compatibility reasons, which are not detailed in the Contract Documents, any substitution shall provide the functional intent as well as the specified intent in all details, as determined by the Engineer.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 MEETINGS

- A. Contractor to attend at no additional cost to Owner.
- B. Preconstruction conference to be scheduled by Engineer.
- C. Progress or special meetings as deemed necessary and scheduled by Owner or Engineer.
- D. Special and final inspections by Owner or Engineer when requested.

END OF SECTION

SECTION 01 32 13

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 REQUIREMENTS

- A. Promptly after award of the Contract, prepare and submit to Engineer estimated construction progress schedules for the Work, with sub-schedules of related activities which are essential to its progress.
- B. Submit revised progress schedules.
- C. Schedule subject to approval of Engineer.
- D. Schedule construction working hours.

1.02 FORM OF SCHEDULES (A OR B)

- A. Prepare schedules in the form of a horizontal bar chart:
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Horizontal time scale: Identify the first work day of each week.
 - 3. Scale and spacing: To allow space for notations and future revisions.
- B. Prepare schedules in the form of "C.P.M."
- C. Format of Listings: The chronological order of the start of each item of work.

1.03 CONTENT OF SCHEDULES

- A. Construction Progress Schedule:
 - 1. Show the complete sequence of construction by activity.
 - 2. Show projected percentage of completion for each item, as of the first day of each month.
- B. Provide sub-schedules to define critical portions of prime schedules.

1.04 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.

3. Revised projections of progress and completion.
4. Other identifiable changes.

- C. Provide a narrative report as needed to define:
1. Problem areas, anticipated delays, and the impact on the schedule.
 2. Corrective action to be taken.

1.05 SUBMISSIONS

- A. Submit initial schedules within 15 days after award of Contract.
1. Engineer will review schedules and return review copy within 10 days after receipt.
 2. If required, resubmit within 7 days after return of review copy.
- B. Submit schedule marked up to show actual progress of Work with each application for payment: Section 01 29 00 – Payment Procedures.
- C. Submit revised progress schedules when requested by Engineer or whenever project is more than 5% behind approved schedule as determined by monthly request for payment.

1.06 DISTRIBUTION

- A. Distribute copies of the reviewed schedule to:
1. Contractor's project field office.
 2. Engineer

1.07 CONSTRUCTION WORKING HOURS SCHEDULING

- A. Notify engineer at least 48 hours in advance of any work to be done outside of usual working hours or any change in usual working hours.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Product Data
- B. Contractor Responsibility
- C. Engineer Responsibility
- D. Project Record Documents

1.02 RELATED WORK/REQUIREMENTS SPECIFIED ELSEWHERE

- A. Conditions of the Contract: Definitions and Additional Responsibilities of Parties

1.03 PRODUCT DATA

- A. Preparation:
 - 1. Provide information required in individual Sections.
 - 2. Where sheets are reproduced from a pamphlet, catalog, or similar publication, print the manufacturer's name and the title of the publication on each sheet, or set of sheets, if it is not already on the sheet.
 - 3. Clearly mark each copy to identify applicable products or models by either neatly encircling pertinent data or marking the circle with an arrow or by crossing out all extraneous data, with black, indelible ink. Do not use highlighter because it will not reproduce well.
 - 4. Show performance characteristics and capacities.
 - 5. Show dimensions and clearances required.
 - 6. Indicate weights of major components.
 - 7. Indicate materials of construction.
 - 8. Do not prepare submittal materials from facsimile (FAX) copies of product data unless specifically authorized by Engineer.
 - 9. Material described on Drawings but not shown in the Specifications: Provide cut sheets as a minimum, or as called for on the Drawings.
- B. Installation data for all materials and equipment for which operation and maintenance manuals will not be provided. Also provide installation data with shop drawing prior to delivery of equipment, if specified in the equipment Section.
 - 1. Provide manufacturer's installation instructions and recommendations.

2. Provide referenced standards for installation.

- C. Manufacturer's standard schematic drawings, diagrams, descriptions and information:
 - 1. Modify to delete information that does not apply to Work.
 - 2. Supplement to provide information specifically applicable to the Work.

1.05 CONTRACTOR RESPONSIBILITIES

- A. If substitutions of materials are proposed, conform to Section 01 25 00-Substitution Procedures.
- B. Submit exactly the required quantity of materials.
- C. Review Shop Drawings, Product Data, Certificates, Electrical Schematics, Electrical Connection Diagrams, Test Reports, Installation Instructions, Samples, and similar required submittal materials for completeness and accuracy prior to submission. Return unsatisfactory submittal materials to the supplier or manufacturer for correction.
- D. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with specifications.
 - 5. Conflicts with other items of construction past, present, or future.
 - 6. Submittal materials are legible.
- E. Coordinate each submittal with requirements of the Work and of the Contract Documents.
- F. Notify the Engineer in writing, at time of submission, of any deviations in submittal from Contract requirements.
- G. Begin no fabrication or work that requires submittals until return of submittals with Engineer's final review.

1.05 LIMITS OF ENGINEER'S RESPONSIBILITY

- A. Engineer's review does not constitute acceptance or responsibility for accuracy of dimensions or quantities.
- B. Engineer's review does not relieve the Contractor from meeting requirements of the Contract Documents.
- C. Engineer's review does not constitute approval for any deviation from the Contract

Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation.

- D. Engineer's review does not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the Contractor's Responsibilities portion of this Section.
- E. Engineer's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

1.06 PROJECT RECORD DOCUMENTS

- A. If the equipment installed deviates in any way from the submittal for the equipment, then submit copies of submittals that are corrected to show actual equipment supplied.

END OF SECTION

SECTION 01 35 33.01

DISINFECTION OF DOMESTIC WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide personnel, equipment, and supplies, disinfect and test all potable water systems, including water treatment systems, waterlines, water storage reservoirs, water wells, and new building system including flushing at completion of treatment.

1.02 RELATED REQUIREMENTS

- A. AWWA Standards

1.03 QUALITY ASSURANCE

- A. Regulatory Agency Requirements: Comply with applicable state requirements.

1.04 SUBMITTALS

- A. Test Reports: Submit two (2) copies as follows:
 - 1. Disinfection report, include:
 - a. Date issued
 - b. Project name and location
 - c. Treatment contractor's name, address, and phone number
 - d. Type and form of disinfectant used
 - e. Time and date of disinfectant injection start
 - f. Time and date of disinfectant injection completion
 - g. Test locations
 - h. Initial and 24-hour disinfectant residuals in ppm for each outlet tested
 - i. Time and date of flushing start
 - j. Time and date of flushing completion
 - k. Disinfectant residual after flushing in ppm for each outlet tested
 - 2. Bacteriological report, include:
 - a. Date issued
 - b. Project name and location
 - c. Laboratory's name, certification number, address, and phone number
 - d. Time and date of water sample collection
 - e. Name of person collecting samples
 - f. Test locations

- g. Time and date of laboratory test start
- h. Coliform bacteria test results for each outlet tested
- i. Certification that water conforms or fails to conform to bacterial standards of Federal Safe drinking Water Act.
- j. Microbiologist's signature

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect against damage and contamination.
- B. Maintain caution labels on hazardous materials.
- C. Maintain storage room dry and with temperatures as uniform as possible between 60 degrees F (15.6 degrees C) and 80 degrees F (26.7 degrees C).

1.06 PROTECTION

- A. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Disinfectant:
 - 1. Free chlorine; liquid, powder, tablet or gas: Per AWWA B300.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to starting Work verify that domestic water system is completed and cleaned.
- B. Do not start Work until conditions are satisfactory.

3.02 SYSTEM TREATMENT

- A. Water Distribution and Transmission System: Per AWWA C651

3.03 BACTERIOLOGICAL TEST

- A. Take samples where and when as required by referenced standards or codes.

- B. Analyze water samples in accordance with “Standard Methods for the Examination of Water and Wastewater”, latest edition, published by American Water Works Association.
- C. Analyzed water samples as otherwise required or allowed by referenced standards or codes.

3.04 DISPOSAL OF HEAVILY CHLORINATED WATER

- A. Test heavily chlorinated water for chlorine residual in accordance with Appendix S of the AWWA C651.
- B. Chlorine residual of water being disposed of, shall be neutralized in accordance with Table C.3 included in Appendix C of the AWWA C651 to meet residual acceptable for domestic use.
- C. Dispose of water flushed from water main, after neutralization to designated arroyo.

3.05 FAILURE OF DISINFECTION AND/OR BACTERIOLOGICAL TESTS

- A. If test results do not comply with criteria required by referenced standards or codes, system shall undergo disinfection in accordance with Section 5.2 of the AWWA C651.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 SPECIAL

- A. EPA –United States Environmental Protection Agency.
- B. OSHA – Occupational Safety and Health Administration
- C. NMED – New Mexico Environment Department

1.02 OTHER

- A. As indicated on the Drawings, as apparent from the Drawings, or in accordance with standard practice.

END OF SECTION

SECTION 01 45 23

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Employ and pay for the services of an independent testing laboratory to perform specified services and testing associated with soil gradation and density, and as applicable.

1.02 ADDITIONAL REQUIREMENTS

- A. Conditions of the Contract: Testing required by laws, ordinances, rules, regulations, orders or approval of public authorities.
- B. Each specification section listed: Laboratory tests required and standards for testing.

1.03 SUBMITTALS

- A. Submit for Engineer's review the name of proposed Laboratory to perform required testing and their statement of qualifications.

1.04 QUALIFICATION OF LABORATORY

- A. Meet basic requirements of ASTM E329, "Standard Specification Agencies Engaged in Testing and/or Inspection of Materials Used in Construction".
- B. Authorized to operate in the State in which the Project is located by the local governing authority for the AASHTO Accreditation Program.
- C. Testing Equipment:
 - 1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards.
 - b. Accepted values of natural physical constants.

1.05 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.

- B. Perform specified inspections, sampling and testing of materials and methods of construction:
1. Comply with specified standards.
 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.
- D. Promptly submit written report of each test; one copy to Engineer, one copy to Structural Engineer, and copies as required to Contractor. Each report shall include:
1. Date issued.
 2. Project title and number.
 3. Testing laboratory number, address, and telephone number.
 4. Name and signature of laboratory technician.
 5. Date and time of sampling or field testing.
 6. Record of temperature and weather conditions.
 7. Date of test.
 8. Identification of product and specification section.
 9. Location of sample or test in the Project.
 10. Type of test.
 11. Results of tests and compliance with Contract Documents.
 12. Interpretation of test results when requested by Engineer.
- E. Perform additional tests as required by Engineer or the Owner.
- F. In all cases, the Engineer shall determine the number, type and location of tests.
- G. Provide signature and seal of a Professional Engineer, licensed in the State where work is being performed, and who is employed by the Laboratory on all test results.

1.06 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of the Contractor.

1.07 CONTRACTOR'S RESPONSIBILITIES

Cooperate with laboratory personnel; provide access to work, and manufacturer's

operations.

- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Furnish copies of Product test reports as required.
- D. Furnish Incidental Labor and Facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3. To facilitate tests.
 - 4. For storage and curing of test samples.
- E. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience and retests required for previously failed tests.
- F. Notify testing laboratory at least 48-hours in advance of all testing required by job progress or conditions, or the Engineer.
- G. Provide on-site facilities as required for initial curing of concrete cylinders.

1.08 PAYMENT

- A. All work, labor, materials, appurtenances, activities, and requirements to provide and perform Testing Laboratory Services as specified herein and to comply with all requirements and conditions of the Contract Documents are considered incidental work to the Contract Documents Bid Items. No separate, additional, or special payment will be due for this incidental work.
- B. Costs for testing described in Paragraph 1.07.F are not eligible for reimbursement.

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 WATER

- A. Water required for construction may be drawn from Owner's water system without charge. Coordinate with Owner's representative as to location of water supply point.

1.02 ELECTRICITY

- A. Contractor's sole responsibility and expense.

1.03 OTHER

- A. All other temporary utilities required to accomplish the Work to be the responsibility of and at the Contractor's sole expense.

1.04 RELATED REQUIREMENTS

- A. Section 01 52 13 – Field Offices, Sheds, and Staging Site

1.05 SPECIAL PROJECT REQUIREMENTS SCHEDULE

- A. Provide sanitary facilities for Contractor's personnel. Use of Owner's restrooms by Contractor's personnel will not be permitted.

END OF SECTION

SECTION 01 52 13

FIELD OFFICES, SHEDS, AND STAGING SITE

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain storage and work sheds needed for construction and temporary field office during entire construction period.
- B. At completion of Work, remove field offices, sheds, and contents.

1.02 OTHER REQUIREMENTS

- A. There is no area available within public right-of-way for a field office, shed, or staging site within the project limits. The Contractor may elect on his own to make arrangements to use private property for this purpose. Prior to any use of private property for purposes related to this project, the Contractor shall submit to the Owner a copy of the document granting permission to use the property.
- B. Furnish, install, and maintain temporary electrical, telephone, and other services, as needed.

1.03 REQUIREMENTS FOR FACILITIES

- A. Construction:
 - 1. Structurally sound, weather tight, with floors raised above ground.
 - 2. Temperature transmission resistance: Compatible with occupancy and storage requirements.
 - 3. At Contractor's option, portable or mobile buildings may be used. Mobile homes, when used, shall be modified for office use.

1.04 USE OF FACILITIES

- A. Existing facilities at site shall not be used for field offices or for storage.

1.05 MATERIALS, EQUIPMENT, FURNISHINGS

- A. May be new or used, but must be serviceable, adequate for required purpose, and must not violate applicable codes or regulations.

1.06 PREPARATION

- A. Fill and grade sites for temporary structures to provide surface drainage.

1.07 INSTALLATION

- A. Construct temporary field offices and storage sheds on proper foundations; provide connections for utility services.
 - 1. Secure portable or mobile buildings when used.
 - 2. Provide steps and landings at entrance doors.

1.08 MAINTENANCE AND CLEANING

- A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment, and services.

1.09 REMOVAL

- A. Remove temporary field offices, contents, and services when no longer needed.
- B. Remove storage sheds when no longer needed.
- C. Remove foundations and debris; grade Site to required elevations and clean areas.

1.10 MEASUREMENT AND PAYMENT

- A. Field offices and sheds are considered incidental to the Work to be completed. No separate payment shall be made for field offices and sheds.

END OF SECTION

SECTION 01 56 00

BARRIERS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain suitable barriers as required to prevent public entry, and to protect the public, Work, and existing facilities; remove when no longer needed or at completion of Work.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 BARRIERS

- A. Materials to Contractor's option, as appropriate to serve required purpose.

PART 3 EXECUTION

3.01 GENERAL

- A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.
- B. Maintain barrier during entire construction period.
- C. Relocate barriers as required by progress of construction.
- D. Provide barriers to protect the public from excavations and hazardous conditions and operations.
- E. Trenches shall not be left open overnight or during non-working hours, per Section 31 23 33 – Trenching and Backfilling.

3.02 REMOVAL

- A. Completely remove barricades, including foundation, when construction has progressed to the point that they are no longer needed.

- B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART I GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control; remove physical evidence of temporary facilities at completion of Work.

1.02 NOISE CONTROL

- A. Limit to practical extent.
- B. Limit to normal working hours when practical.

1.03 DUST CONTROL

- A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere.

1.04 WATER CONTROL

- A. Provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties.
 - 1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.
- B. Provide, operate and maintain hydraulic equipment or adequate capacity to control surface water.
- C. Dispose of drainage water and dewatering water in a manner to prevent flooding, erosion or other damage to any portion of the site or to adjoining areas. Any public agency or private landowner arrangements, permits, or other approvals required for the discharge of water are the sole responsibility of the Contractor.

1.05 PEST CONTROL

- A. As found necessary during construction.

1.06 RODENT CONTROL

- A. Provide rodent control as necessary to prevent infestation of construction or storage area.
 - 1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.
- B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations and applicable laws and regulations.

1.07 DEBRIS CONTROL

- A. Maintain all areas under Contractor's control free of extraneous debris.
- B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
 - 1. Provide containers for deposit of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
 - 2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
 - a. Provide periodic inspection of traffic areas to enforce requirements.
- C. Schedule periodic collection and disposal of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
 - 1. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.08 POLLUTION CONTROL

- A. Provide methods, means and facilities required to prevent the discharge of hazardous substances from construction operations.
- B. Perform emergency measures required to report, contain and transport harmful substance discharges or spills by complying with Federal and State regulations.
- C. Take special measures to prevent harmful substances from entering public waters.
 - 1. Prevent disposal of wastes, effluents, chemicals or other such substances adjacent to streams, or in sanitary or storm sewers.
- D. Provide systems for control of atmospheric pollutants.
 - 1. Prevent toxic concentrations of chemicals.
 - 2. Prevent harmful dispersal of pollutants into the atmosphere.

1.09 EROSION CONTROL

- A. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 - 1. Hold the areas of bare soil exposed at one time to a minimum.
 - 2. Provide temporary control measures such as berms, dikes, drains, straw bales, and silt fences.
- B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.
- C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

1.10 SECURITY CONTROL

- A. Provide temporary padlocks during construction on gates, hatches, doors, panels, and boxes having hasps. Coordinate with Owner to install specified permanent padlocks at completion of project.

END OF SECTION

SECTION 01 58 01

PROJECT BULLETIN BOARD

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and Maintain Bulletin Board:
 - 1. Weathertight
 - 2. Approximately 3' x 5'.
 - 3. Location approved by Project Manager
 - 4. Accessible to employees

- B. Display:
 - 1. Equal employment opportunity poster
 - 2. Federal and State wage rate information
 - 3. Safety posters
 - 4. Official announcements and notices

END OF SECTION

SECTION 01 66 01

PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. For the purposes of this Specification Section, the terms "material and equipment" and "Products" have the same meaning and are used interchangeably.
- B. Material and equipment incorporated into the Work:
 - 1. New and free of defect unless otherwise shown on the Drawings.
 - 2. Conform to applicable specifications and standards.
 - 3. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer.
 - 4. Manufactured and Fabricated Products:
 - a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
 - c. Two or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 - 5. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 REUSE OF EXISTING MATERIAL

- A. Except as specifically indicated or specified, materials and equipment removed from the existing structure shall not be used in the completed Work.

1.03 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, such instructions shall be included with:
 - 1. Shop drawing and/or product data submitted if an operation and maintenance manual is not required, or if specified in the Shop Drawing subsection of the equipment section.
 - 2. Operation and maintenance data if required.

- B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
 - 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
 - 1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 - 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.05 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible.
 - 1. Store products subject to damage by the elements in weathertight enclosures.
 - 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- B. Exterior Storage:
 - 1. Store fabricated Products above the ground, on blocking or skids, prevent soiling or staining. Cover Products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 - 2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

- D. Protection After Installation:
 - 1. Provide substantial coverings as necessary to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.
- E. Repair Damage:
 - 1. Repair damaged materials and equipment to new condition or replace with new, to the satisfaction of the Engineer. Refer to Conditions of the Contract.

END OF SECTION

SECTION 01 71 23

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and pay for Field Engineering Services required for Project:
 - 1. Survey work required in execution of Project.
 - 2. Engineering work for civil, structural or other professional engineering services specified or required to execute Contractor's construction methods.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Survey work during construction may be completed by the Contractor. However, all locations/elevations must be verified at the completion of the contract by a qualified land surveyor registered in the state in which the construction is being done. Final survey data shall be documented on the Record Drawings.
- B. Engineering work by a qualified professional engineer registered in the state in which the construction is being done.

1.03 SURVEY REFERENCE POINTS

- A. Original basic horizontal and vertical control points for the Project are those designated on drawings.
- B. Locate existing control points, re-establish original control points, protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to Engineer.
 - 2. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - 3. Require surveyor to replace Project control points which may be lost or destroyed.
 - 4. Establish replacements based on original survey control.
- C. Reconfirm all existing and original vertical elevation control points prior to the use of such points for project surveying. Reference control point for such reconfirmation is shown on Drawings.
- D. Refer any apparent discrepancies to Engineer for resolution. Surveyor to assist Engineer with field work required for resolution of such apparent discrepancies.

1.04 PROJECT SURVEY REQUIREMENTS

- A. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 - 1. Site improvements.
 - 2. Stakes for grading, fill and topsoil placement.
 - 3. Utility slopes and invert elevations.
 - 4. Batter boards for structures.
 - 5. Building foundation, column locations, and floor levels.
 - 6. Controlling lines and levels required for mechanical and electrical trades.
- B. From time to time, verify layouts by same methods as required for control of the Work and when requested by the Engineer.
- C. The Contractor shall take reasonable efforts to protect all existing property corners, permanent bench marks, right-of-way markers, government established monuments, and similar reference points. If any must be disturbed, the monuments must be referenced before removal and replaced as soon as work in the area is completed. Referencing and replacing shall be done by a licensed surveyor, and in the case of U.S.G.S. monuments and NMDOT right-of-way markers, shall be a first order survey work.

1.05 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. On completion of improvements, prepare record drawings showing all dimensions, locations, and elevations of construction.

1.05 SUBMITTALS

- A. Submit name and address of surveyor and professional engineer to Engineer.
- B. Submit documents certifying current registration of surveyor and engineer.
- C. On request of Engineer, submit documentation to verify accuracy of filed engineering work.
- D. Survey data and computations for all Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning, during progress of the work, and at completion of the work, as required by General Conditions.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Each Specification Section: Cleaning for specific products or work.

1.03 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.02 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.

Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.03 DUST CONTROL

- A. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.04 FINAL CLEANING

- A. Type 2 - For Grounds:
1. Broom clean exterior paved surfaces; rake clean other ground surfaces.
 2. Remove grease, mastic, adhesives, dust, dirt, stains, labels and other foreign materials from all piping systems surfaces and equipment.
 3. Prior to final completion or Owner occupancy, Contractor shall conduct an inspection of site, exposed interior and exterior surfaces, and all work areas to verify that the entire Work area is clean.

END OF SECTION

SECTION 01 74 17

STORM DRAINAGE DISCHARGE COMPLIANCE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Prepare a Storm Water Pollution Prevention Plan (SWPPP) to control storm water discharges from construction activities during the Project that disturb one or more acres, and comply with all other requirements of the USEPA-NPDES Program.

B. Scope of Work:

1. Work includes compliance with the U.S. Environmental Protection Agency (EPA), National Pollution Discharge Elimination System (NPDES) Regulations for Storm Water Discharges from construction sites, per 40 CFR, Parts 122, 123, and 124. Additional information on the EPA Construction General Permit (CGP) and SWPPP for construction activities can be found at:
<http://cfuub.epa.gov/npdes/stormwater/cgp.cfm>
<http://cfuub.epa.gov/npdes/stormwater/swppp.cfm>
2. Develop and submit a site-specific SWPPP prior to commencement of construction, and implement and maintain Best Management Practices (BMPs) identified in this plan to control erosion, pollution, sediment, and runoff during the construction of the Project. Storm water pollution prevention practices shall meet the current standards of the industry and all of the requirements of the current CGP. Contractor is encouraged to use the SWPPP template and reporting forms provided at the referenced web site.
3. Contractor shall determine and identify in the SWPPP if the Project is in an Arid or Semi-Arid area as defined in Appendix A – Definitions and Acronyms, of the CGP.
4. If the disturbed area is less than five acres, the Project duration is short and avoids the wet season, and the erosivity index (R factor) for the site is low, Contractor may apply for a Low Erosivity Waiver (LEW) Certification. The LEW calculation procedures and Certification Form are found on the referenced EPA websites. Contractor may use the calculation tool on the following EPA website to determine whether or not the site is eligible for a LEW.

<http://cfuub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm>

If the site is eligible for a LEW and Contractor properly submits the LEW Certification Form, Contractor is exempt from the requirements to prepare a SWPPP. Although the Contractor is not required to prepare a formal SWPPP

document, it shall still be responsible for general good housekeeping of the site such as track-out prevention, concrete washout, erosion control, litter control, and any other appropriate efforts.

5. Contractor shall conduct site inspections, monitoring, and testing as required in the CGP and complete reports within the time required.
6. Contractor shall maintain and update the SWPPP as necessary and required by the CGP.
7. Contractor shall have the SWPPP available for review at all times.
8. The SWPPP must include a site-specific interim and permanent stabilization plan, and Contractor shall provide the post-construction inspections and documentation for the plan for not less than three (3) years after completion of the construction, as provided for in section 9.4 – Region 6, of the CGP.
9. Contractor shall follow Reclamation Seeding 31 25 01 of the Technical Specifications.
10. Contractor shall remove non-permanent BMPs at completion of the Project.
11. All work specified in this Specification Section shall be provided by Contractor under the bid item listed in the Bid Form or, if no bid item is listed, shall be provided as incidental work at no additional cost to Owner.

C. Compliance with Storm Drainage Discharge Requirements

1. Contractor shall meet all requirements of the most current version of the NPDES General Permit for Discharge from Construction Activities (CGP).
2. Contractor shall file a Notice of Intent (NOI) at least 14 days prior to commencing earth-disturbing activities and is required to use EPA's electronic NOI system or "eNOI system" to prepare and submit the NOI.
3. Contractor shall file a Notice of Termination (NOT) and is required to use EPA's electronic NOI system or "eNOI system" to prepare and submit the NOT.
4. Owner will assist Contractor with the necessary information for preparation and certification of its subsequent NOI and NOT.

D. Contractor shall also submit one (1) copy of the completed SWPPP to Owner no later than 14 calendar days after time Contractor submits his NOI.

E. By completing the NOI, Contractor is certifying to Owner that a SWPPP has been completed in conformance with the CGP Permit and is in Contractor's possession.

F. Contractor is the designated "Operator" of the Permit and is solely responsible for execution of the Project construction in conformance with CGP Permit condition(s) and requirement(s), including work performed by any subcontractor(s). Contractor shall immediately correct conditions related to the Project that are in violation of Permit requirements. Failure by Contractor to correct such conditions in a timely manner may subject Contractor to fines and/or penalties.

- G. Contractor shall indemnify, defend, and hold Owner and its Representative(s) harmless from any fines and/or penalties issued for violations of Permit conditions.
- H. In the event Contractor fails to comply with NPDES Permit requirements, Owner retains the right to enter upon the Project site and perform corrective measures. Any costs associated with corrective measures shall be the responsibility of, and shall be paid by, Contractor. Owner shall be entitled to deduct such costs from remaining Contract Amounts, and if insufficient Contract Amounts exist, Contractor shall reimburse Owner for any deficiency.
- I. If payment for the SWPPP is listed as a bid item in the Bid Form, payment shall be made in increments equal to the percent complete on the overall Project, except the last 10% of the payment for said item shall not be made until the Vegetative Stabilization Report is complete and delivered to both Owner and the NMED in conformance with Section 9.4.1.5 of the 2012 CGP.

END OF SECTION

SECTION 01 74 20

FILL AND WASTE MATERIAL

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide all fill material required to complete Work.
- B. Dispose of all waste material generated by construction activities, unless otherwise stated in Contract Documents. Properly dispose of all materials in accordance with regulatory requirements.
- C. No additional cost to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing the work.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

1.03 SUBSTANTIAL COMPLETION

- A. When Contractor considers the Work is substantially complete, he shall submit to Engineer:
 - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion.
- C. Should Engineer determine that the Work is not substantially complete:
 - 1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
 - 2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.
 - 3. Engineer will reinspect the Work.

1.04 FINAL INSPECTION

- A. When Contractor considers the Work is complete, he shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 - 5. Work is completed and ready for final inspection.

- B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer consider that the Work is incomplete or defective:
 - 1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Engineer that the Work is complete.
 - 3. Engineer will re-inspect the Work.
- D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the contractor to make closeout submittals.

1.05 REINSPECTION FEES

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

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED\

- A. Maintain at the site for the Owner one record copy of:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other Modifications to the Contract
 - 5. Engineer Field Orders or written instructions
 - 6. Approved Shop Drawings, Product data and Samples
 - 7. Field Test records
 - 8. Receipts for delivery of items to Owner

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office or other secure location apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with specification format.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by Engineer and Owner.

1.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by Engineer.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in neat, large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.

- C. Drawings: Legibly mark to record actual construction:
1. Depths of various elements of foundation in relation to finish first floor datum.
 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 4. Field changes of dimension and detail.
 5. Changes made by Field Order or by Change Order.
 6. Details not on original contract drawings.
 7. For sewer lines: Invert elevations at manholes, line and manhole alignment and locations, and location of each service line referenced by distance from downstream manhole and distance from sewer centerline to end of service line.
- D. Specifications and Addenda: Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number and Supplier for each Product and item of equipment actually installed.
 2. Changes made by Field Order or by Change Order.

1.05 SUBMITTAL

- A. At Contract close-out, deliver Record Documents to Engineer for the Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
1. Date
 2. Project title and number
 3. Contractor's name and address
 4. Title and number of each Record Document
 5. Signature of Contractor or his authorized representative

1.06 PAYMENT

- A. Project record documents are incidental to Work for which no separate payment will be made.
- B. No payment will be made to the Contractor for any portion of the work for which the project record documents, including recording, are not complete.
- C. As-built drawings need to be continuously updated. Failure to do so will be grounds for withholding payment.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This work shall consist of shaping road beds and side ditches to subgrade preparation to the depths indicated on the Drawings.

1.02 REFERENCE STANDARDS

- A. American Society for testing and Materials:
1. ASTM D1556, Density of Soil in Place by the Sand-Cone Method
 2. ASTM D1557, Test for Moisture-Density Relations of Soils Using 10-lb. Hammer and 18-in. Drop.
 3. ASTM D2167, Density of Soil in Place by the Rubber-Balloon Method.
 4. ASTM D2216, Laboratory Determination of Moisture Content of Soil.
 5. ASTM D2922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 6. ASTM D3017, Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- B. NMDOT Specifications (2007) Section 208

1.03 QUALITY ASSURANCE

- A. Testing Laboratory:
1. Contractor will provide material testing for quality control during earthwork operations.

1.04 JOB CONDITIONS

- A. Do not construct embankments when atmospheric temperature is below 35° F.

PART 2 PRODUCTS

2.01 BORROW

- A. Borrow shall consist of materials obtained from approved borrow areas designated by the Engineer for the construction of embankments.
- B. Provide free of vegetation.

2.02 WASTE

- A. Disposal of excess excavation shall be the responsibility of the Contractor. Excess material to be placed in location approved by Engineer.

2.03 EXCAVATION

- A. Includes excavation, removal, backfill, and satisfactory disposal of all materials encountered in the work.

2.04 EMBANKMENT

- A. Embankment construction shall consist of the formation of embankments with suitable material from on-site excavation.

PART 3 EXECUTION

3.01 GENERAL

- A. No materials shall be wasted without permission from the Engineer.
- B. Perform clearing operations prior to beginning excavation, grading and embankment operations.

3.02 GRADING

- A. Provide uniform slopes and rounded changes in slope, free of low spots.
- B. The degree of grade control shall not deviate from true grade and profile more than one-half inch as measured by a ten-foot straightedge.
- C. Drainage:
 - 1. Provide and maintain positive surface water drainage around and away from open excavations.
 - 2. Keep opened excavations dry.
 - 3. Remove free water in excavations promptly.

3.03 EMBANKMENT

- A. Embankments shall meet the compaction requirements specified in Subsection 3.05.
- B. No frozen material, brush, sod, or unsuitable material shall be placed in the

embankments.

- C. In the distribution of embankment material, avoid lenses differing substantially from the surrounding material.
- D. Deliver materials to the embankment in such a manner as to result in a well and uniformly compacted embankment.

3.04 EMBANKMENT AND BACKFILL COMPACTION

- A. General:
 - 1. Compact in eight-inch loose horizontal layers.
 - 2. Use moistened material when necessary.
 - 3. Layers shall be uniformly compacted before a succeeding layer is placed.
 - 4. Add water in sufficient quantity to obtain the specified compaction.
 - 5. Do not allow free water to stand on an embankment surface.
 - 6. Compaction shall be accomplished by approved methods and equipment.

- B. Degree of Compaction:
 - 1. Optimum density will be determined in accordance with ASTM D1557.
 - 2. Perform compaction as follows:

<u>Description</u>	<u>Percent of Maximum Dry Density to be not less than</u>	<u>Variation Optimum Moisture</u>
Embankment and backfill under roads, lift station , or where otherwise scheduled	95	+2
General area grading not included in the above	90	+2

3.05 FIELD QUALITY CONTROL

- A. Field control of density of in-place material will be determined in accordance with any of the following methods:
 - 1. Nuclear Method, ASTM D2922
 - 2. Rubber-Balloon Method, ASTM D2167
 - 3. Sand-Cone Method, ASTM D1556
- B. Field control of moisture content will be determined in accordance with either of the following methods:
 - 1. Nuclear Method, ASTM D3017
 - 2. Laboratory determination, ASTM D2216

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structure and Site Excavation, Filling and Backfilling
- B. Compaction of Fill and Backfill
- C. Finish Grading

1.02 SUBMITTALS

- A. Laboratory Test Results for Select Fill, Ordinary Fill, and Pea Gravel:
 - 1. Moisture-density relationships (ASTM D1557)
 - 2. Gradation (ASTM C136, ASTM 422)
 - 3. Liquid limit, plastic limit, plasticity index (ASTM D43118)

1.02 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as a portion of final site.
- B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.
- C. Protect above and below grade utilities which are to remain.
- D. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- F. Grade excavation top perimeter to prevent surface water run-off into excavation.
- G. Protect structure walls, foundation, and similar features from structural stress during backfilling operations.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Material removed from excavations may be used for fill or backfill provided such material meets the requirements for fill and backfill specified in this Section. Some blending of materials may be necessary.
- B. Exclude debris, large rocks, roots, organic material, expansive material and other deleterious materials.
- C. Provide additional fill materials if necessary from off-site locations obtained by Contractor.
- D. Do not use any materials containing any contaminants that may endanger public health. Do not use mine tailings.
- E. Do not use any materials which have not been approved by the Engineer.

2.02 MATERIALS

- A. Select Fill:
 - 1. Clean, well graded, relatively cohesionless material free of organic or frozen matter.
 - 2. Largest rock or clod dimension, 1".
 - 3. Plasticity index less than 8.
 - 4. Maximum percent passing sieve (unless otherwise approved by Engineer):
 - a. #10, 50%
 - b. #40, 30%
 - c. #200, 15%
- B. Ordinary Fill:
 - 1. Clean, free of organic or frozen matter.
 - 2. Largest rock or clod dimension, 3".
 - 3. Normally acceptable are Unified Soil Classification System Classified Materials: GW, GP, SW, SP, GM, SM, or GC.
- C. Normal Backfill:
 - 1. Excavated earth or sand thoroughly mixed to create uniform material.
 - 2. Free of trash, debris, organic or frozen matter.
 - 3. Largest rock or clod dimension, 2".
- D. Pea Gravel:
 - 1. Mineral aggregate graded 0.25" to 0.38".
 - 2. Free of soil, clay and shale; free of organic, frozen debris, or foreign matter.

- E. Sandfill:
 - 1. Clean, well-graded material conforming to requirements of ASTM C33 for fine aggregate.

- F. Moisture Barrier: 10 mil minimum polyethylene sheet.

PART 3 EXECUTION

3.01 GENERAL

- A. The type of bearing material and the thickness and extent of structural fill (if required) are shown on the Drawings.
- B. Interior non-structural slabs-on-grade are to be supported on granular fill not less than 6 inches thick on structural fill not less than one foot thick. See Drawings for location where sand fill over polyethylene moisture barrier is required over granular fill.
- C. Do not place or compact fill or backfill when the atmospheric temperatures are below 35 degrees Fahrenheit. Protect completed fill or backfill areas from freezing. Recondition, reshape and recompact to the requirements of this section without additional cost to the Owner any areas which are damaged by freezing.

3.02 SHEETING, SHORING AND BRACING

- A. Provide sheeting, shoring and bracing where required to hold walls of excavation and to protect workers and existing construction. Contractor shall be responsible for proper sizing and placement of Work.
- B. Remove sheeting, shoring and bracing in manner to avoid damage to disturbance to Work. Leave sheeting and shoring in place where removal will endanger Work, adjacent construction or personnel. If sheeting or shoring is to be left in place, remove all traces of sheeting or shoring to a minimum depth of 2'-0" below finish grade unless otherwise approved by the Engineer.

3.03 CLEARING AND GRUBBING

- A. General: Clearing and grubbing are required for all areas shown on the plans to be excavated or where fill is to be constructed.
- B. Clearing:
 - 1. Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.

- C. Grubbing:
1. Remove stumps, matted roots, and roots larger than 2 inches in diameter from within 6 inches of the surface of areas on which fills are to be constructed, and within 18 inches of finished subgrade of roadway.
 2. Areas disturbed by grubbing shall be filled as specified in this section of embankment.

3.04 PREPARATION

- A. Excavation:
1. Identify required lines, levels, contours, and datum.
 2. Identify all underground utilities and other facilities. Stake and flag locations.
 3. Identify and flag surface and aerial utilities.
 4. Maintain and protect existing utilities remaining which pass through work area.
- B. Backfilling:
1. When necessary, compact subgrade surfaces to density requirements for backfill material.
 2. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with select fill and compact to density equal to requirements for subsequent backfill material.

3.05 EXCAVATION

- A. Earth excavation shall consist of the excavation and removal of suitable soils for use as embankment as well as the satisfactory disposal of all vegetation, debris, and deleterious materials encountered within the area to be graded and/or in a barrow area.
- B. Excavate soil to the extent required for construction operations and other work.
- C. Barricade open excavations, keep spoil piles out of the way of the Owner's personnel and otherwise maintain safe access by the Owner's employees to the Owner's facilities during construction.
- D. Do not undercut existing construction.
- E. Do not permit surface water to enter open excavations. Provide barriers and positive drainage away from excavations from any source.
- F. Machine slope banks.
- G. After excavations are complete, notify Engineer for inspection of completed excavation. Do not begin placement of fill or begin other construction operations until

excavation is approved by Engineer.

- H. Fill unauthorized over excavated areas beneath structures with select fill and compact to density required for subsequent fill or backfill. If unauthorized excavation will result in structure being supported partly on select fill and partly on native material, extend excavation under entire structure and fill as specified below. Fill unauthorized overexcavated areas away from structures with fill of the type specified for subsequent fill compacted to the density specified.

3.06 SUBGRADE TREATMENT

- A. At areas to receive structural fill, scarify the exposed native soils to a depth of not less than 12 inches. Add or remove water as necessary to bring the scarified material to optimum moisture content (within -0, +2 percentage points). Compact the scarified soil to not less than 95 percent of maximum dry density as determined by ASTM 01557.

3.07 FILLING AND BACKFILLING

- A. Backfill areas to contours and elevations shown on Drawings using unfrozen materials.
- B. Place fill under structures and elsewhere as shown on the Drawings. Fill all unauthorized or excess excavations to the elevations shown or specified.
- C. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.
- D. Backfilling Around Structures:
 - 1. Backfill after concrete has attained sufficient strength to withstand backfill pressures without detrimental effects.
 - 2. Prevent displacement of construction during backfilling operations; backfill opposite sides simultaneously.
- E. Placement:
 - 1. Maintain surfaces free of water, debris, and other deleterious materials.
 - 2. Place backfill and fill materials in successive horizontal layers not more than 8" in loose depth.
 - 3. Place material at optimum moisture content (plus or minus two percentage points).
 - 4. Material too dry or too wet shall be moistened or aerated to extent necessary to bring moisture content to within specified limits.
- F. Compaction:
 - 1. Compact fill and backfill using appropriate equipment as needed to achieve

the densities specified below. Densities are expressed as percentages of the maximum dry density as determined by ASTM 01557.

2. Do not use heavy equipment in areas where existing construction may be damaged by the use of such equipment. Repair or replace without additional cost to the Owner, any damage to existing construction caused by earthwork operations.

G. Slope grade away from buildings minimum 2 inches in 10 feet unless noted otherwise. Fill depressions and provide for positive drainage away from buildings and structures.

H. Make changes in grade gradual. Blend slopes into level areas. Finish grade to smooth uniformly sloping surfaces to elevations required for drainage.

I. Finish surface by grading to provide finished appearance.

3.08 TOLERANCES

A. Top surface of Backfill: Plus or minus 2 inches.

B. Top surface of Fill beneath Structures: Minus 1 plus 0 inches.

3.09 FIELD QUALITY CONTROL

A. Test Schedule:

1. One field density test for each 100 cubic yards of fill or each layer of fill, whichever results in the greater number of tests.
2. Or where directed by Engineer.

B. If tests indicated that work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

SCHEDULE OF FILL AND BACKFILL

<u>Area</u>	<u>Type of Material</u>	<u>Degree of Compaction</u>
Beneath footings and slabs more than 10 inches thick and for a distance outside their perimeters equal to the depth of fill	Select fill	95%
Beneath slabs less than 10 inches thick; pavements (except roadways) unless otherwise shown on Drawings	Select fill	90%
General fills and Embankments on the site	Ordinary fill	90%
Non-structural areas except as otherwise shown on Drawings or directed by Engineer	Ordinary fill	85%
Backfill behind walls and below or adjacent to additional construction	Select fill	95%
Backfill behind retaining walls	Ordinary fill	90%
Backfill except as described above	Normal backfill	90%
Where indicated on Drawings	Select fill	95%
Fill within treatment structures, fill beneath interior slabs on grade over moisture barrier	Sand fill	95%

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Trenching, Backfilling, and Compacting for Buried Pipes and Manholes
- B. Bedding of Buried Pipes

1.02 REFERENCES

- A. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
- B. OSHA Regulations, 29 CFR 1926 Subpart P - Excavations
- C. Trenching Guidelines New Mexico Department of Game & Fish, Latest Revision

1.03 SUBMITTALS

- A. Testing laboratory results on bedding materials to demonstrate compliance with specifications.

1.04 JOB CONDITIONS

- A. All trenching is unclassified.
- B. Protect adjacent structures and surrounding areas.
- C. Work to remain within available easements.
- D. Weather:
 - 1. No backfill placement during freezing weather.
 - 2. No frozen materials, ice, or snow in backfill or fill.
 - 3. No backfill or fill on frozen surfaces.

1.05 REGULATORY REQUIREMENTS

- A. Comply with OSHA Standard 29 CFR Part 1926, Subpart P – Excavations, during all excavation, trenching, and shoring operations.

- B. Contractor shall follow New Mexico Department of Game and Fish Trenching Guidelines.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding Materials:

1. Bedding materials are those materials located a maximum of 8 inches below bottom of pipe to bottom or spring line of pipe, depending on bedding class or condition required.
2. Material shall be granular and free flowing:
 - a. Maximum particle or clump size:
 - 1) Plastic Pipe 8" Diameter and Smaller: 0.25 inches
 - 2) All other Pipe: 0.75 inches
 - b. Portion Passing No. 200 Sieve: 50% maximum
 - c. Free from refuse, organic material and frozen soils.
3. Materials require prior written approval.

B. Initial Backfill Materials:

1. Initial backfill material is that material placed above the bedding material, around and over the pipe to 12 inches over the top of the pipe.
2. Material to be defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
3. In no case shall initial backfill material contain particles or clumps with any dimension greater than:
 - a. Plastic Pipe 8" Diameter and Smaller: 0.25 inches
 - b. All Other Pipe: 0.75 inches
4. If not otherwise defined, same as bedding material.

C. Backfill Materials:

1. Backfill materials are those materials placed in the trench between the initial backfill material and the top of the trench.
2. Material to be as defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
3. Backfill shall have no particles or clumps having a dimension larger than 6 inches within 3 feet of the top of the pipe.

D. Materials Not Allowed:

1. All pipe bedding, initial backfill, and backfill material shall be clean and free of roots, vegetable or organic material, frozen material, mine tailings, or any contaminants that could endanger public health.

- E. Identification Tape:
1. Identification tape shall consist of high visibility, color coded inert polyethylene tape that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil.
 2. The tape shall have the following properties:
 - a. Minimum overall thickness: 4.0 mils
 - b. Minimum tensile strength: 1500 psi
 - c. Minimum weight: 10 lbs. per 1000 foot unit
 - d. Maximum imprint length: 36 inches
 - e. Width: 3 inches for tape without metallic foil stripes.
 - f. Metallic Foil Stripes: Permanently laminated to the polyethylene tape so that tape may be more readily located using a metal detector.
 3. Tape to meet the APWA Uniform Color Code for utilities.
 4. Imprinted message, "Caution Buried Utility Line Below", printed with black letters on APWA approved colors.
 5. Acceptable Manufacturers:
 - a. Seton Name Plate Co., Branford CT or engineer approved equivalent.

PART 3 EXECUTION

3.01 INSPECTION

- A. Field verify location of underground utilities and obstructions.

3.02 CLEARING AND GRUBBING

- A. General: clear and grub all areas within the construction limits that will be disturbed by trenching or stockpiling.
- B. Clearing: Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.
- C. Grubbing: Remove stumps, matted roots, and roots larger than 2 inches in diameter from areas to be excavated and from within 6 inches of surface of areas to receive stockpiled material. Do not allow grubbed material to mix with trench backfill.
- D. Disposal: Properly dispose of all waste material in accordance with Section 01 74 20 – Fill and Waste Material.

3.03 DEWATERING

- A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the

Work.

- B. Keep excavation dry during subgrade preparation and continuously thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result.
- C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12" below the bottom of the excavation.
- D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.
- E. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes, ditches, etc. shall be left clean and free of sediment.

3.04 BLASTING

- A. Blasting is not allowed.

3.05 SHEETING

- A. If used, cut off at top of pipe and leave in place unless removal is specifically approved by Engineer.

3.06 STABILIZATION

- A. Thoroughly compact and consolidate trench bottoms so they remain firm, dense, and intact during required construction activities.
- B. Remove all mud and muck during excavation.
- C. Reinforce trench bottom with crushed rock or gravel if it becomes mucky during construction activities.
- D. Allow no more than 1/2-inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.
- E. Where trench bottoms-out in rock, rock is to be removed to 8 inches below bottom of pipe and replaced with bedding material.

3.07 TRENCH EXCAVATION

- A. Slope, bench, or support all trenches in conformance with OSHA Excavation Regulations, and follow all specified safety requirements.

The total length of open trench shall not exceed 400 feet, including excavation, pipeline installation, and backfill. No trench shall be opened more than 100 feet in advance of pipeline installation.

- C. Trenches shall be backfilled and compacted the same day as excavation.
- D. Trenches shall not be left open overnight or during non-working hours.
- E. Except where jacking and boring is indicated on the Drawings, specified or permitted by Engineer, excavate trenches by open cut from the surface.
- F. Alignment, Grade, and Minimum Cover:
 - 1. Establish alignment and grade or elevation from offset stakes.
 - 2. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings.
 - 3. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection.
 - 4. Water lines to have minimum bury as shown on the Drawings, and in general, grade shall follow surface contours unless otherwise shown on the Drawings.
- G. Limiting Trench Widths:
 - 1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment.
 - 2. If needed to reduce earth loads to prevent sloughing cut banks back on slopes which extend not lower than 1' above the top of the pipe.
 - 3. Minimum trench widths and minimum clearances between installed pipe and trench wall:

<u>Pipe Size</u>	<u>Minimum Trench Width</u>	<u>Minimum Clearance</u>
18" or less	O.D. plus 16"	8"
Larger than 18"	O.D. plus 24"	12"

- H. Mechanical Excavation:
 - 1. Do not use where its operation would damage trees, buildings, culverts, or other existing property, structures, or utilities above or below ground; hand-excavate only in such areas.
 - 2. Use mechanical equipment of a type, design, and construction and operated so that:
 - a. Rough trench bottom elevation can be controlled.
 - b. Uniform trench widths and vertical sidewalls are obtained from 1'

- above the top of the installed pipe to the bottom of the trench.
- c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls.
- d. Do not undercut trench sidewalls.

I. Cuts in Existing Paved Surfaces:

1. Applies to streets, sidewalks, curbs, driveways, and other existing paved surfaces.
2. No larger than necessary to provide adequate working space.
3. Cut a clean groove not less than 1-1/2" deep along each side of trench or around perimeter of excavation area.
4. Remove pavement and base pavement to provide shoulder not less than 6" wide between cut edge and top edge of trench.
5. Do not undercut trenches, resulting in bottom trench width greater than top widths.
6. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation.
7. Where the trench crosses existing paved surfaces, remove and replace the paved surface between saw cuts as specified for pavement.

J. Excavation Below Pipe:

1. Except as otherwise required, excavate trenches below the underside of pipes as indicated on the drawings to allow placement of granular pipe bedding material.
2. Where excavating in earth for 6-inch and smaller pipe, Contractor has the following options for excavating trench bottoms:
 - a. Excavate below pipe subgrade and place granular embedment.
 - b. Grade trench bottom to provide uniform and continuous support between bell holes or end joints.

K. Excavation for Bell Holes

1. Excavate to provide adequate clearance for tools and methods of pipe installation.
2. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.

3.08 PIPE BEDDING

- A. Class D per ASTM C12
- B. Class C per ASTM C12
- C. Class B per ASTM C12

- D. Crushed stone Encasement per ASTM C12
- E. Class A-I: ASTM C12 Class A-1 using plain concrete
- F. Class A-1: ASTM C12 Class A-1 using reinforced concrete; No. 4 A-36 steel reinforcing bars parallel to pipe with steel area not less than 0.4% of the area of concrete above top of pipe.
- G. Class A-III: ASTM C12 reinforced concrete encasement; 3000 psi concrete; No. 4 A-36 steel reinforcing bars; reinforcing parallel to pipe with steel area not less than 0.4% of the area of concrete above and below pipe; reinforcing bars wrapped around parallel bars at 36" maximum spacing.
- H. Bedding class or type as scheduled.
- I. Carefully place bedding in accordance with ASTM C12 to provide uniform and continuous support to pipe barrel, except at bell holes in all cases. No bridging will be allowed.

3.09 TRENCH BACKFILL

- A. Material as defined by applicable reference for installation for type of pipe used.
- B. Initial Backfill: Place in layers that do not exceed 8 inches in height of backfill material in its un-compacted state.
- C. Backfill: Place in layers heights suitable to enable the Contractor to achieve the specified compaction throughout the full depth of backfill using Contractor's selected means and methods and without damaging the pipe. When pipelines cross under existing utilities, place and compact trench backfill around pipelines and existing utilities, using appropriate methods to ensure proper compaction and to avoid damage to existing utilities.
- D. Bedding, Initial Backfill, and Backfill: If native materials cannot meet the requirements of Part 2 specified herein or if the specified field compaction cannot be obtained, Contractor shall import suitable material at no additional cost to the Owner.
- E. Paved Traveled Areas:
 - 1. 90 percent AASHTO T-180 compaction.
 - 2. Top 12" below subgrade, 95 percent AASHTO T-180 compaction.
- F. Unpaved Traveled Areas and Treatment Plant/Pump Station Sites:
 - 1. 90 percent AASHTO T-180 compaction.

Untraveled Areas: Compacted to at least undisturbed natural density but not less than 85 percent AASHTO T-180.

- H. Water Settled Backfill: Use only where permitted by Engineer:
1. Where permitted, apply to obtain effective settlement with a minimum of water.
 2. Do not permit trench to overflow.
 3. Do not settle by water puddling until after trench has been backfilled to ground surface.
 4. Introduce water above the pipe embedment through a long pipe nozzle so disturbance of granular embedment or compacted material is held to an absolute minimum.
 5. Add backfill material to compensate for settlement below surface grade and settled during puddling operations.
- I. Install identification tape in backfill 24 inches directly above top of all buried pipe, unless otherwise scheduled or shown on Drawings. Use tape with metallic foil stripes for all non-metallic pipes.
- J. Install Utility Marker Posts as Follows:
1. Install posts in untraveled areas over centerline of pipe at each horizontal bend made with fittings and at 500 feet intervals between bends.
 2. Install face of posts perpendicular to centerline of pipe and facing the downstream direction.
 3. Bury posts 18" deep.
- K. Upper 18 inches of trench shall contain no particles larger than 6 inches in any dimension.
- L. Surface Finish:
1. For placement of paving or gravel surfacing, subgrade where applicable.
 2. Match existing and surrounding contours.
 3. Graded finished appearance.

3.11 FIELD QUALITY CONTROL

- A. Section 01 45 23 -Testing Laboratory Services
- B. Section 01 71 23 -Field Engineering
- C. Test Schedule unless otherwise directed by the Engineer:

1. Minimum of one field density test for each compacted layer of trench backfill for each 250 linear feet of trench in traveled areas.
2. Minimum of one field density test for each compacted layer of trench backfill for each 500 linear feet of trench in untraveled areas.
3. Minimum of two field density tests for each compacted layer of trench backfill at each road crossing.

3.12 PIPE BEDDING SCHEDULES

- A. PVC, HDPE, and Other Plastic Type Pipes:
 1. As recommended by manufacturer.
 2. Minimum bedding class:
 - a. Trench depth to top of pipe less than 10'; Class C
 - b. Trench depth to top of pipe 10' or more; Class B
 3. Gravity sewer lines bedded to meet maximum deflection requirements given with pipe specifications.
- B. Unstable Trench Conditions Due to Groundwater
 1. Crushed Stone Encasement

END OF SECTION

SECTION 31 25 01

RECLAMATION SEEDING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Preparation of subsoil.
- B. Seeding, hydroseeding.
- C. Mulching.
- D. Maintenance.

1.02 DEFINITIONS

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

1.03 QUALITY ASSURANCE

- A. Native seeds shall consist of pure live seed mixed at rates as scheduled and noted. Alternate seed blends may be substituted only if specified on the plans. All labels from seed bags to be retained for verification.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Each bag of seed shall be sealed and labeled by the seed dealer in accordance with Federal Seed Laws and New Mexico Department of Agriculture Labeling Laws. This includes: Variety, kind of seed, lot number, purity, germination, percent crop, percent inert, percent weed (including noxious weeds), origin, test data and net weight. Federal Seed Laws require that analysis shall be no older than 5 months for seed shipped interstate and no older than 9 months for seed shipped intra-state.
- B. Store and protect seed in a manner so as to prevent damage by traffic or inclement weather.

1.05 COORDINATION

- A. Coordinate the work of this Section with grading, construction and utility operations.

1.06. MAINTENANCE SERVICE

- A. Maintain seeded areas until the Date of Acceptance by the Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE SEED SUPPLIERS

- A. Plants of the Southwest, Santa Fe, New Mexico.
- B. Curtis & Curtis, Inc., Clovis, New Mexico.
- C. Albuquerque Chemical Company.
- D. Granite Seed, Lehi, Utah.

2.02 SEED MIXTURE

- A. See Schedule.

2.03 ACCESSORIES

- A. Mulching Material:
 - 1. Mulching Material: Oat, barley, or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Chopped cornstalks are not acceptable. Moldy or rotted straw are not acceptable. Hay is acceptable if cut prior to seed formation. Hay composed of native grasses to be seeded will be acceptable. Hay shall be properly cured and harvested at least 60 days prior to use.
- B. Fertilizer: No fertilizer or other soil amendments are required on areas specified to receive native seeding.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth.
- D. Herbicide: Not required.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this Section.
- B. Beginning of installation means acceptance of existing site conditions.

3.02 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign material, clods and large stones, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
- C. Immediately prior to seeding, scarify or otherwise loosen subsoil to a depth of 4 inches where seeding is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.03 SEEDING

- A. Uniformly apply the approved prescribed mix and the rate over the indicated seeded area.
- B. Do not seed before the middle of May or after the middle of September.
- C. The Contractor's vehicles and other equipment shall not travel over the seeded areas.
- D. Seeding shall be undertaken subject to the following:
 - 1. Drill seeding. All seeding operations, where practical, shall be accomplished by drilling and shall be across the slope. Drill seed in cross directions with 50% of the seed applied in each direction. Plant seed approximately $\frac{1}{4}$ inch deep, with a maximum depth of $\frac{1}{2}$ inch. If the furrow openers on the drill exceed 8 inches, the area shall be drilled twice. Seeding shall be done with reclamation seeding equipment in working order with double disc openers, depth bands, drop tubes, packer wheels or drag chains, rate control attachments, seed boxes with agitators.
 - 2. Broadcasting. Broadcast seeds by a mechanical spreader at twice the rate specified for drill seeding. Cultipack seeds to a minimum depth of $\frac{1}{4}$ inch and a maximum of $\frac{1}{2}$ inch.
 - 3. Hydroseeding. Hydroseeding will not be allowed on areas of non-irrigated native seeding unless specified on the plans.
- E. Do not sow immediately following rain, when ground is too dry, or during periods of high winds.

- F. No more area shall be seeded than can be mulched and crimped by the end of the workday.

3.04 MULCHING

- A. Immediately following seeding and compacting, apply mulch at a rate of 2 tons per acre for areas drill seeded or broadcast seeded and 2 ½ tons per acre for hydroseeded areas. Spread uniformly over the area either by hand or with a mechanical spreader. When spread by hand, tear bales apart and fluff before spreading. Mulching will not be permitted when wind velocity exceeds 15 miles per hour. Mulch placed in the manner noted above shall be anchored into the soil. A heavy disc such as a mulch tiller, with flat serrated discs at least ¼ inch in thickness, having dull edges, spaced no more than 9 inches apart, shall be used to anchor the mulch into the soil where specified. The discs shall be of sufficient diameter to prevent the frame of the equipment from dragging the mulch. Anchor mulch to a minimum depth of 2 inches and so not cover with excessive amounts of soil. Anchoring operations shall be across the slope where practical with no more than two passes of the anchoring equipment. Wet straw down and allow to soften for 15-30 minutes to be crimped. Crimp mulch to a minimum depth of 2 inches with crimper discs 6 to 8 inches apart. Crimp lines shall not be parallel to prevailing westerly winds. Crimping lines shall be in a north-south direction or they shall be tight interlocking "S" curves to avoid east-west crimp lines.
- B. Apply water with a fine spray immediately after each area has been mulched to provide approximately ¼ inch of water over the newly seeded area. The truck shall not be driven over newly seeded areas, and the water pressure shall not be so strong as to disturb the mulch on the ground.

3.05 MAINTENANCE

- A. Roll surface to remove minor depressions or irregularities.
- B. Immediately reseed areas which show bare spots.
- C. Protect seeded areas with signs during maintenance period.

3.06 SCHEDULE

A. Seed mix:

Alias	Scientific Name	Common Name	Quantity
G1	Bouteloua eriopoda	Black Grama	0.5 lb
G2	Bouteloua gracilis	Blue Grama	0.5 lb
G3	Bouteloua curtipendula 'Vauclm'	Sideoats Grama	0.5 lb
G4	Schizachyrium scoparius 'pastura'	Little Bluestem	0.5 lb.
G5	Hilaria jamesii	Galleta	1 lb.
G6	Oryzopsis hymenoides	Indian Ricero-ass	2 lb.
G7	Sitanion hystrix	Bottlebrush Squirreltail	1 lb
G8	Sporobolus cryptandrus	Sand Dropseed	0.5 lb.
H1	Cercocarpus montanus	Alderleaf Mountain Mahogany	0.5 lb.
H2	Artemisia tridentata	Big Sage	1 lb.
H3	Gutierrezia sarothrae	Snake Weed	1 lb.
H4	Catilleja intermedia	Indian Paintbrush	1 lb.
H5	Oenothera caespitosa	White Evening Primrose	1 lb.
H6	Machaeranthera tanacetifolia	Purple Aster	2.5 lb.
H7	Ratibida columnaris	Yellow Prairie Cone Flower	0.5 lb.
		Total Pure Live Seed	

- B. Limits: All disturbed areas with the exception of roads and driveways related to construction of the waterline.

END OF SECTION

SECTION 32 09 00

REMOVAL AND REPLACEMENT OF EXISTING STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Removal and replacement of existing asphalt and concrete paving, sidewalks, curb and gutter, and driveways removed incidental to the Work of the contract.

1.02 REFERENCES AND RELATED REQUIREMENTS

- A. New Mexico Department of Transportation requirements for pavement sections unless scheduled or specified otherwise.

1.03 TESTING AND INSPECTION

- A. Representative samples shall be taken from each concrete truck and tested for:
 - 1. Slump.
 - 2. Air entrainment.
 - 3. Compressive strength (7 day, 14 day, 28 day) (4 cylinders per truck).

PART 2 PRODUCTS

2.01 MATERIALS

- A. All replacement materials to be new and of same quality or better than existing.

PART 3 EXECUTION

3.01 REMOVAL

- A. Asphaltic and Concrete Paving Material:
 - 1. Sawcut lines, the full depth of the material, straight and parallel without abrupt jogs, vertical to the surface.
 - 2. Broken out and removed entirely; rubble to be wasted at an approved location.
- B. Sidewalks and Curb and Gutter:
 - 1. Sawcuts at existing joints only.
 - 2. Broken out and removed entirely; rubble to be wasted at an approved location.

- C. Gravel Surface and Subgrade Material:
 - 1. Removed entirely.
 - 2. May be stockpiled and reused for replacement or removed and wasted at an approved location.
 - 3. Material for reuse must be clean, free of debris, organic and deleterious substances, and used only with the approval of the Engineer.

3.02 PREPARATION FOR REPLACEMENT

- A. Subgrade material same thickness and type as removed.
- B. Subgrade compaction as shown on the drawings, not less than 90% modified Proctor.
- C. Existing gravel materials to be reused to be clean as required.

3.03 REPLACEMENT SCHEDULE

- A. Replacement shall be constructed to conform to existing lines, grades, shape, thickness, and finish, unless otherwise scheduled or shown on Drawings.
- B. Asphalt pavement to be placed with laydown machine when practical.
- C. Mix design for asphalt pavement shall meet New Mexico Department of Transportation Department Plant Mix Bituminous Pavement (PMBP), Gradation B requirements.
- D. Quality control for Asphalt Pavement Compaction:
 - 1. Monitor the compaction process by determining the density of the PMBP with a portable nuclear density test device in conformity with ASTM D 2950. Calibration of the portable nuclear device shall be established from cut pavement samples. The density readings of the cut pavement samples shall be determined in accordance with AASHTO T 166 (weight, volume method) and the density readings of the pavement shall be determined by the portable nuclear density test device in conformity with ASTM D 2950 and shall be correlated by the test lab. Conduct three density tests for each 500 sy, or fraction thereof, of each lift each day.
 - 2. The range density for acceptance of PMBP shall be 95% ($\pm 3\%$) of the theoretical maximum density as determined from AASHTO T 209.
- E. Concrete pavement, curb and gutter and gutter and sidewalks shall conform to Division 03, except the minimum 28-day compressive strength shall be 3,000 psi.

- F. Base course mix design shall conform to the New Mexico department of Transportation, Standard Specifications for Highway and Bridge Construction, current edition-Section 304, gradation I-B.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Placement of crushed aggregate base course to the depths and grade as indicated on the Drawings.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T-11, Amount of Material Finer Than .075 mm Sieve in Aggregate.
 - 2. AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregate.
 - 3. AASHTO T-90, Determining the Liquid Limit of Soils.
 - 4. AASHTO T-96, Determining the Plastic Limit and Plasticity Index of Soils.
 - 5. AASHTO T-96, Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
 - 6. AASHTO T-104, Soundness of Aggregate in Place by Nuclear Methods (Shallow Depth).
- B. American Society for Testing Materials:
 - 1. ASTM 01557, Moisture-Density Relations of Soils Using 10-lb. (4.5 kg) Rammer and 18-in. (457 mm) Drop.
 - 2. ASTM 02922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 3. ASTM 03017, Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. NMDOT Specifications (2007)
 - 1. Section 303 – Base Course (QLA)
 - 2. Section 304 – Base Course

1.03 QUALITY ASSURANCE

- A. Allowable Tolerances:
 - 1. Thickness: In place compacted thickness will not be acceptable if exceeding 1", plus or minus from thicknesses shown on Drawings.
 - 2. Surface Smoothness:

- a. Test finished surface of base course for smoothness, using a 10 ft. straightedge applied parallel to and at right angles to centerline of roadway.
- b. Check surfaced areas at intervals directed by Engineer.
- c. Surfaces will not be acceptable if exceeding 3/8" in 10 ft.

B. Testing Laboratory:

1. Contractor will provide material testing for quality control during crushing and laying operations.

C. Sieve Analysis:

1. The grading of the combined aggregates shall be within the designated limits, and shall not vary from the high percentage passing area on one sieve to the low percentage passing on an adjacent sieve. The material shall be uniformly graded from coarse to fine as indicated by a plot on a standard power gradation chart, and approved by the Engineer.

1.04 SUBMITTALS

A. Certificates:

1. Provide certificates.
2. Certify that materials comply with specification requirements.
3. Signed by material manufacturer and Contractor.

B. Samples:

2. Provide samples of material to laboratory for testing prior to placing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Base Course:

1. Coarse Aggregate: Sound, angular crushed stone, crushed or screened gravel.
2. Fine Aggregate: Well graded natural sand or stone screenings.
3. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting composite mixture meets the following requirements when tested in accordance with AASHTO T11 and T27:

<u>Sieve Size</u>	<u>Percentage of Weight Passing</u>
1"	100
3/4"	80-100
No. 4	30-60
No. 10	20-45
No. 200	3-10

- 4 Resistance to Abrasion: wear of 50% or less as determined by AASHTO T96.
- 5 Soundness (coarse aggregate): Loss of 18% or less as determined by AASHTO T104 (Magnesium Sulfate).
- 6 Liquid Limit: 25 or less as determined by AASHTO T89.
- 7 Fractured faces: 50% or more of all plus No. 4 sieve material shall have 2 fractured faces (minimum).
- 8 Plasticity Index: 6 or less as determined by AASHTO T90.

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof Roll:
 1. Proof roll prepared subgrade surface using heavy, rubber-tired rollers.
 2. Check for unstable areas.
 3. Check for areas requiring additional compaction.
- B. Loose and Foreign Material:
 1. Remove loose and foreign material from compacted subgrade surface immediately before placing aggregate base course.
 2. Use power brooms or blowers, and hand brooming as required.
 3. Do not displace subgrade material.
- C. Moisture Content:
 1. Do not place aggregate base course when the moisture content of the top 6 inches of subgrade exceeds +2% optimum as determined by ASTM 01557.

3.02 MIXING AND PLACING

- A. Provide a homogeneous mixture of unsegregated and uniformly dispersed materials as placed in position for compacting.
- B. Plant and equipment shall be adequate in all respects.
- C. Mix and place base course materials by the following method:
 1. Stationary Plant Method:
 - a. Mix base course material and water in an approved mixer.
 - b. Add water during mixing operation in the amount necessary to provide the optimum moisture content for placement plus or minus two percentage points.
 - c. After mixing, transport the base course material to the job site while it contains the proper moisture content.
 - d. Without delay, spread the base course material uniformly on the subgrade

so that when compacted, it will conform to the finish thickness.

3.03 SHAPING AND COMPACTING

- A. Compacted Thickness:
 - 1. Maximum compacted thickness of any one layer: 6 inches.
- B. Compact to not less than 96% of maximum dry density as determined by ASTM D1557.
- C. Start rolling at the edge and proceed toward the center, except on superelevated curves, roll from the lower to the upper side.
- D. Continue blading, wetting, and rolling until a dense, smooth, unyielding and well-bonded base course is obtained for the full width and depth.

3.04 FIELD QUALITY CONTROL

- A. Field control of density of in-place material will be determined in accordance with Nuclear Method, ASTM D2922.
- B. Field control of moisture content of in-place material will be determined in accordance with Nuclear Method, ASTM D3017.
- C. Sample and Test:
 - 1. Each layer of base course.
 - 2. At intervals not to exceed 200 linear feet.
 - 3. Sampled after base course has been mixed, laid down and initial compaction operation has begun.
 - 4. At locations directed by the Engineer.

3.05 SCHEDULE

- A. New Mexico Department of Transportation crushed aggregate base course gradation I-B may be used for this project in place of the gradation and material properties specified in Part 2. Gradation and material properties must be current and certified by the New Mexico Department of Transportation. Thickness shall be as indicated on the Drawings.

END OF SECTION

SECTION 32 12 01

PAVING, GRAVEL, SURFACING, AND RESURFACING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Subgrade preparation.
- B. Crushed aggregate base course.
- C. Prime coat.
- D. Asphaltic concrete surface course.
- E. Paving repair and replacement.
- F. Repair and replacement of gravel and other surfacing.

1.02 REFERENCES AND RELATED REQUIREMENTS

- A. Asphalt Institute Manuals:
 - 1. "Mix design Methods for asphalt Concrete", MS-2
 - 2. "Asphalt Plant Manual", MS-3
 - 3. "Asphalt Paving Manual", MS-8

1.03 SUBMITTALS

- A. Aggregate: Material certificates and laboratory analysis.
- B. Prime and tack coats: Material certificates for each load.
- C. Asphaltic Concrete:
 - 1. Job mix formula for each type supported by:
 - b. Evidence of mix design procedure.
 - c. Complete aggregate analysis.
 - d. Marshall curves.
 - e. Mixing and placing temperatures.

2. Job mix formula may be one successfully used in the area if supported by recent certified test reports.

1.04 TESTING AND INSPECTION

- A. Testing: Take representative samples from the asphalt plant and the laydown surface and test in accordance with the following standard test procedures:
 1. Resistance to Plastic Flow - ASTM D 1559.
 2. Bulk Specific Gravity of Compacted Bituminous Mixtures: ASTM D 1118 or ASTM D 2726.
 3. Quantitative Extraction of Bitumen from Bituminous Paving Mixtures: ASTM D 2171.
 4. Sieve or Screen Analysis of Fine and Coarse Aggregates (extracted sample):
ASTM C 136.
 5. Density of Bituminous Concrete in Place:
 - a. Nuclear Method ASTM D 2950 or,
 - b. ASTM D 1188 or ASTM D 2726.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subgrade: Existing in-place soil except that organic materials, solid obstructions, muck and other unsuitable materials shall be removed. Filling pockets in the subgrade with base course material or asphalt will generally not be permitted .
- B. Crushed Aggregate Base Course: Base course aggregate shall be composed of materials consisting of crushed stone, crushed or screened gravel, caliche, sand or a combination of such materials. Base course aggregate shall be free from vegetable matter and all other deleterious materials. When the stationary plant method is used, base course aggregate will be accepted immediately following mixing based on periodic samples taken from the pugmill output. When a road mix method is used, base course aggregate will be tested for acceptance on samples taken from the watered and completely processed window.

1. Base course aggregate will be tested in accordance with AASHTO methods provided below or in accordance with other approved methods:

Mechanical Analysis	AASHTO T27
Passing No. 200 Sieve	AASHTO T 11
Liquid Limit	AASHTO T 89
Los Angeles Abrasion	AASHTO T 96
Soundness (5-cycle-	

Magnesium Sulfate Solution)
Linear Shrinkage
Materials testing
Control Manual

2. Base course aggregate materials shall be combined in such proportions that the resulting composite blend meets the requirements of one of the following classes:

<u>Sieve Size</u>	<u>Class A</u>	<u>Class B</u>
1"	100	100
3/4"	80-100	85-100
No. 4	30-60	40-70
No. 10	20-45	30-55
No. 200	3-10	4-12
Soundness	18 or less	18 or less
L.A. Abrasion	50 or less	50 or less
L.L.	25 or less	25 or less

3. Fifty percent by weight of all plus No. 4 materials shall have a minimum of two mechanically fractured faces.

C. Prime and Tack Coats: Emulsified asphalt suitable for the intended use and local soil conditions.

D. Asphaltic Concrete: Mixture of mineral aggregate and paving asphalt (asphalt cement) mixed at a central mixing plant delivered as specified:

1. Asphalt cement: As recommended in the approved job-mix formula.
2. Aggregates:
 - a. Tested in accordance with the following AASHTO methods:

Mechanical Analysis	AASHTO T 30
Passing No. 200 Sieve	AASHTO T 27
Liquid Limit	AASHTO T 89
Los Angeles Abrasion	AASHTO T 96
Soundness (Magnesium Sulfate)	AASHTO T 104

- b. Asphalt concrete aggregate shall have a percent of wear of 40 or less and the course aggregate shall have a soundness loss of 15 or less. All material passing the No. 40 sieve shall be non-plastic. The amount of crushing shall be regulated so that at least 60 percent, by dry weight, of the plus No. 4 sieve material shall have a minimum of 2 fractured faces.

- c. Gradation requirements:

Class "A"

<u>Sieve Size</u>	<u>% Passing</u>
1"	100
3/4"	80-100
1/2"	60-90
3/8"	50-80
No. 4	33-60
No. 40	7-20
No. 200	2-8

Class "B"

<u>Sieve Size</u>	<u>% Passing</u>
3/4"	100
1/2"	75-95
3/8"	65-85
No. 4	40-60
No. 10	32-45
No. 40	10-22
No. 200	3-8

The grading of the combined aggregates as selected for the job mix design, shall be within the designated limits, and shall not vary from the high limit on one sieve to the low limit on the adjacent sieve, or vice versa, but shall be uniformly graded from coarse to fine. The percentages shown are based on the weight of dry aggregate only. Sieve analysis shall be made in accordance with ASTM C 136 or AASHTO T 30.

3. Proportioning: the job-mix formula designed to achieve the following test properties subject to verification by field testing:

	<u>Surface Course</u>
Stability (Marshall – 75 Blow Briquette)	1500 lbs.+
Flow (Marshall)	8-16
Percent of Voids	3-7
Percent of Voids Filled With Asphalt	75-85
Percent Asphalt Cement Content by Weight	
Optimum of Total Mix	+0.4%
Sand Equivalent	40 or more
Compaction (% of max. laboratory density)	96% minimum

4. Tolerances: If a mixture produced varies from the designated amounts by more than the following tolerances, proper changes shall be made until subsequent mixtures are within those tolerances:

Passing No. 4 and larger sieves	+7 percent
Passing No. 8 to No. 100 sieves (incl.)	+4 percent
Passing No. 200 sieve	+2 percent
Bitumen (tank strap method)	+0.3 percent
Bitumen (extraction method)	+0.5 percent
Temperature of Mixture	+20 degrees F
Hydrated Lime	+0.3 percent
Portland Cement	+0.3 percent

5. Voids: For the purpose of calculating the percentage of voids in total mix and voids filled with asphalt, the specific gravities of the various aggregates shall be selected as follows:

- a. When the absorption of the aggregate, as determined by applicable ASTM C 128 or ASTM C 127, is less than one percent, the apparent specific gravity shall be used.
- b. When the absorption of the aggregate, as tested by ASTM C 128 or ASTM C 127, is one percent or greater, the mean between the bulk and the apparent specific gravities shall be used.
- c. Test properties shall be determined from the average of three Marshall test specimens (or the residue from 3 test specimens).

- E. Open Graded Friction Course: Mixture of crushed stone or crushed gravel and bituminous materials mixed at a central mixing plant delivered as specified:

1. Asphalt Cement: As recommended in the approved job-mix formula.
2. Aggregates:
 - a. Shall be crushed stone or crushed gravel, composed of hard durable pebbles or fragments so as to provide a material that will meet the following grading requirements when tested by means of AASHTO T11 and T30.
 - b. At least 75 percent of the material retained on the No. 4 Sieve shall be particles having at least two fractured faces.
 - c. Shall be free from vegetable matter, lumps or balls of clay, adherent films of clear or other material that will prevent through coating with asphaltic material.
 - d. Shall have a percentage of wear of not more than 40 or less, and shall have a soundness loss of 8 or more.
 - e. Shall be from a single source, blending from multiple source will not be permitted.
 - f. Gradation Requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1/2"	100
3/8"	90-100

No. 4	25-55
No. 10	0-10
No. 40	0-8
No. 200	0-4

- F. Mine tailings may be incorporated into the work only with the prior specific written approval of the Engineer.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Rough Grading Requirements: Section 31 23 00, Excavation and Fill.
- B. Any underlying soft or otherwise unsuitable material shall be removed and replaced with suitable material from excavation or borrow.
- C. Scarified, watered, and compacted to 95% of modified Proctor density (AASHTO T-180) at optimum moisture content plus or minus (\pm) 2%, to a depth of 12" minimum.
- D. Subgrade upon which pavement, sidewalk, curb and gutter, driveways or other structures are to be directly placed shall not vary more than 1/4 inch from the specified grade and cross section. Subgrade upon which subbase or base material is to be placed shall not vary more than 1/2 inch from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

3.02 CRUSHED AGGREGATE BASE COURSE

- A. Subgrade:
 - 1. Cleaned of all loose and deleterious materials.
 - 2. Free from frozen material.
 - 3. Top 6 inches shall have a moisture content not exceeding optimum plus or minus 2 percent as determined by AASHTO T 180.
- B. Mixing and Placing:
 - 1. Mixing shall provide a homogenous mixture of unsegregated and uniformly dispersed materials as placed in position for compacting.
 - 2. Plant and equipment shall be adequate in all respects.
 - 3. Spread and compact base course in layers which will permit the required density to be obtained.
 - 4. Density requirements will be determined by AASHTO T 180.
 - 5. Unless otherwise provided, base course compacted to not less than 100 percent of the laboratory established density.

6. Densities will be determined in compliance with AASHTO T 205, use of nuclear methods in conformity with AASHTO T 238 and T 239, or other approved methods.
7. Top surface of base course shall not deviate in excess of 1/4 inch when tested with a 10-foot straightedge in any direction. All deviations from this tolerance shall be corrected.

C. Acceptable Mixing and Placing Methods:

1. Stationary Plant Method:
 - a. Base course material and water mixed in an approved mixer.
 - b. Water added during the mixing operation in the amount necessary to provide the optimum moisture content for placement plus or minus two percentage points.
 - c. The base course material transported to the job site while it contains the proper moisture content and placed without delay on the roadbed by means of an approved aggregate spreader.
2. Travel Plant Method:
 - a. Material for each layer of base course placed through an aggregate spreader or window sizing device.
 - b. Base uniformly mixed by a traveling mixing plant.
 - c. During mixing, water added in an amount sufficient to provide the optimum moisture content plus or minus two percentage points at the time of placement of material.
3. Road Mix Method:
 - a. Material for each layer of base course placed.
 - b. Materials mixed by means of motor graders or other suitable equipment until the mixture is uniform throughout.
 - c. Water added during mixing sufficient to provide the optimum moisture content plus or minus two percentage points at the time of placement of material.

3.03 PRIME COAT

- A. The use of prime coat shall be optional with the Contractor, recognizing that its primary value is in protecting the base course before it is covered with the asphalt surface course. If prime coat is used, it shall be so applied that it will penetrate and seal, but not flood, the base course surface. Any excess prime coat shall be dried up with blotter sand. Prime coat shall be properly cured out before the surface course is placed.

3.04 TACK COAT

- A. The contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like, shall be cleaned and painted with tack coat just before the adjoining asphaltic concrete is placed.

- B. Where multi-lift construction is called for, a light tack coat shall be used between lifts if the underlying surface has become dirty or give other signs that the lifts may not bond together properly without the aid of a tack coat. However, tack coat shall be used as sparingly as possible to achieve the intended purpose.

3.05 ASPHALTIC CONCRETE

- A. The base course shall be cleaned, inspected, and all deficiencies corrected well in front of the laydown machine. Removing deficient base course material and filling the pocket with asphaltic concrete will not generally be permitted.
- B. Manhole frames and valve covers shall be adjusted prior to placing the surface course.
- C. At the time of delivery to the site of the work, the temperature of mixture shall be not lower than that required to obtain the density specified.
- D. When hauling time from the mixing plant to the job site exceeds two hours or when inclement weather prevails, bituminous mixtures shall be covered with tarpaulins while being hauled. The tarpaulins shall completely cover the load and be firmly tied down. Mixtures shall be delivered to site of the work without segregation of the ingredients.
- E. Asphalt concrete may be placed when the temperature is 40°F and rising and the weather is favorable as determined by the Engineer. None may be placed in wet weather or on a wet surface.
- F. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that after rolling it will be of the specified cross section and grade of the course being constructed.
- G. Depositing and spreading of the asphalt concrete shall be accomplished by means of self-propelled mechanical spreading and finishing machine designed especially for that purpose and which permits depositing and spreading in a strip 8 to 14 feet in width. The machine shall be equipped with a vibrating or tamping screed capable of being accurately regulated and adjusted to distribute a layer of the material to a definite predetermined thickness and template. The paving machine shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except this shall not apply when asphaltic concrete is placed adjacent to concrete pavement or gutter. Subsequent passes shall utilize a matching device of 1-foot minimum length, riding on the adjacent lift.

- H. Placing once commenced must be continued without interruption. No greater amount of the mixture shall be delivered in any one day than can be properly distributed and rolled during that day during daylight hours.
- I. In narrow, deep or irregular sections, intersections, turnouts, or driveways, where it is impractical to spread and finish the base and level the surface mixtures by machine methods, the Contractor may use spreading equipment or acceptable hand methods approved by the Engineer.
- J. Care shall be exercised in connection with the construction of joints to ensure that the surface of the pavement is true to grade and cross section.
- K. In making the joint along any adjoining edge such as a curb, gutter, or an adjoining pavement and after the hot mixture is placed by the finishing machine, sufficient hot material shall be carried back to fill any space left open. This joint shall be properly "set up" with the back of a rake at proper height and level to receive the maximum compression under rolling. The work of "setting up" this joint shall be performed by competent workmen who are capable of making a correct, clean, and neat joint.
- L. Longitudinal and transverse joints shall be made in a careful manner. Well-bonded and sealed joints are required. Joints between old and new pavements or between successive days' work shall be carefully made in such a manner as to insure a thorough and continuous bond between the old and new surfaces. In the case of surface course, the edge of the old surface course shall be cut back for its full depth so as to expose a fresh surface and, if necessary, to obtain a well-bonded joint, shall be painted with a tack coat after which the hot surface mixture shall be placed in contact with it and raked to a proper depth and grade. Before placing mixture against contact surfaces of curbs, gutters, headers, manholes, etc., they shall be painted with a tack coat.
- M. Rolling shall be commenced with a steel wheel roller along the lower edge of the area to be rolled and be continued until the edge is thoroughly compacted, after which the roller shall be gradually advanced to the crown point, both sides being rolled in a like manner. Rolling shall be continued with steel and pneumatic wheel rollers until the layer has become thoroughly compacted throughout and is true to grade and cross section.
- N. Rollers shall be maintained in good mechanical condition, and those that cannot be operated without jerking or driven along a straight path shall not be used. No leakage from any roller shall be allowed to come in contact with the pavement being constructed nor shall any roller be permitted to stand motionless on any portion of the

work before it has been properly compacted. Steel roller wheels shall be treated with water or oil to prevent the adherence of the asphalt concrete, and water or oil may be used on pneumatic-tired rollers but the quantity used must not be such as to be detrimental to the surface being rolled.

- O. Final rolling of the top or finish course shall be accomplished with a steel wheel roller, removing all surface imperfections, including indentures made by pneumatic- tired rollers.
- P. Rolling of any asphaltic concrete course shall be continued until all roller marks are eliminated and a density of at least 96% of the density of a laboratory specimen of the same mixture has been obtained.
- Q. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand operated mechanical tampers. Any mixture that becomes mixed with foreign materials or in any way is defective shall be removed, replaced with fresh mixture, and compacted to the density of the surrounding pavement.
- R. Upon completion, the pavement shall be true to grade and cross section. Except at intersections or any changes of grade, when a 10-foot straightedge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straightedge more than 3/16 inch. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the Engineer at the expense of the Contractor.
- S. The Contractor shall cut samples as requested by the Engineer for testing the in-place compacted thickness of any asphaltic concrete course. Any area found to be more than 1/4" deficient in thickness shall be removed and satisfactorily replaced by the Contractor. If the average of all the thickness tests indicate that the entire course is deficient in excess of 1/8", the Contractor shall provide a 1" asphaltic concrete surface course overlay at no additional cost to the Owner or other corrective action as approved by the Engineer.

3.06 RESTORATION OF EXISTING SURFACES

- A. Roadways, parking areas, other traveled areas not scheduled:
 - 1. Fully restored equivalent to what existing surfacing would have been when new.
 - 2. Materials and installation as appropriate to conform to this Section.
 - 3. Thickness, grades, alignment, and materials to match existing.
 - 4. All work performed on NMDOT right-of-way shall meet the Standard Specifications for Road and Bridge Construction (current edition) and

conform with NMDOT requirements.

5. All pavement cuts to be by saw to give straight edges and lines.
6. Asphalt pavement to be placed with laydown machine when practical.
7. Pavement removal and replacement payment limit: 10 feet maximum for all non-scheduled surfaces regardless of width actually removed and replaced.

3.06 SCHEDULE OF THICKNESSES AND GRADATION

- A. Thickness required as shown on the Drawings.
- B. Gradation shall be as specified for SP IV.

END OF SECTION

SECTION 33 05 23.01

JACKING AND BORING

PART 1 GENERAL

3.04 WORK INCLUDED

- A. Boring drilling or jacking operations for casing for water pipe, sanitary sewer pipe, storm sewer pipe, and traffic conduit in areas where trenching is not feasible.
- B. Contractor shall maintain at all times a file at the job site containing NMSHTD, railroad, or other permits required to perform the work.

1.02 RELATED WORK

- A. Section 33 12 01 – Water Systems

PART 2 PRODUCTS

2.02 MATERIALS

- A. Steel Casing:
 1. Electric resistance welded tubing for sizes 26 inch O.D. and under.
 2. Double-submerged arc-welded for sizes 28 inch O.D. and over.
 3. ASTM A-53 Steel, Grade B with beveled ends for sizes 26 inch O.D. and under.
 4. API 5LB steel with beveled ends for sizes 28 inch O.D. and over.
 5. Standard class wall thickness for all casing sizes.
 6. Size and thickness:

Steel Casing Diameter Nominal / I.D.	Steel Casing Nominal Wall Thickness	Nominal Ductile Iron Carrier Pipe Size
14"/13.25"	.375"	6"
16"/15.25"	.375"	8"
18"/17.25"	.375"	10"
22"/21.00"	.500"	12"
24"/23.00"	.500"	14"
26"/25.00"	.500"	16"
30"/29.00"	.500"	18"
36"/35.00"	.500"	24"
42"/41.00"	.500"	30"

- B. Carrier Pipe:
 - 1. 24" and Smaller: Ductile iron pipe, push-on joints with gasket-type integral joint restraint (U.S. Pipe Fild Lok 350 or American Ductile Iron Pipe Fast-Grip), as Specified in Section 33 12 01 – Water Systems.
 - 2. 30" and Larger: Ductile iron pipe, push-on joints, with the external mechanical restraint devices, as specified in Section 33 12 01 – Water Systems.
 - 3. Extend carrier pipe and restrained joints 1'0" beyond each end of casing.

2.03 APPURTENANCES

- A. Casing Spacer:
 - 1. Shell and Risers: T-304 passivated stainless steel or fusion bonded thermoplastic powder coated steel, 14 gage minimum, flanges ribbed for strength, two-piece bolt-on shell, 8" wide minimum, 3 bolts per flange.
 - 2. Liner: PVC or EPDM, 0.090" thick, 85-90 durometer "A", overlap edges, ribbed.
 - 3. Runners: UHMW polymer or glass filled polymer, mechanically attached to risers or shell.
 - 4. Fasteners: T-304 stainless steel, 5/16".
 - 5. Acceptable Manufacturers
 - a. Cascade Waterworks Manufacturing Company, Model CCS
 - b. Advance Products and Systems, Inc. Model SSI, SI, SSIM and SIM
 - c. Engineer approved equivalent.
- B. Casing End Seals:
 - i. Construction: Rubber seal with steel bands.
 - ii. Seal: Virgin SBR Rubber
 - iii. Bands: T-304 stainless steel
 - iv. Wrap-around seam sealed with bonding cement or mastic.
 - v. Acceptable Manufacturers:
 - a. Cascade Waterworks Manufacturing Company, Model CCES
 - b. Advance Products and System, Inc. Model AC, AW, or AZ
 - c. Engineer approved equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Water, Sewer, and Storm Drain:
 - 1. Completed to the alignment and grade shown on the construction drawings.
 - 2. Earth and/or rock augers shall not exceed the O.D. of the steel casing by more than ¼ inch.
 - 3. Use equipment for boring and insertion of steel casing capable of simultaneous operation.

4. Feed rate of augers and hydraulic pushing of the casing shall be the same.
5. Avoid loss of earth.
6. Excavated material shall be removed from the casing as excavation progresses and no accumulation of such material within the casing shall be permitted.
7. Fill voids around the outside face of the casing by grouting when operation is complete.
8. Grouting equipment and material shall be on the job site before boring operations are started on order that grouting around the bored casing may be started immediately after the boring operations have finished.
9. Carrier pipe shall be skidded through the casing on casing spacers in centered positioning.
10. Place casing spacers within two (2) feet from each end of the casing. Place three (3) spacers on first pipe section, then two (2) every pipe section thereafter at each joint, and at the center of each carrier pipe section.
11. Modify casing spacer placement to meet spacing manufacturer and pipe manufacturer recommendations.
12. Contractor to located all underground and overhead utilities before beginning boring operations and shall repair any damage to utilities resulting thereto.
13. Only workmen experienced in the boring operation shall perform the work.

B. Electrical Conduit:

1. Use approved jacking or drilling methods.
2. Non-metallic conduit shall not be installed by jacking.
3. Non-metallic conduit shall be installed by drilling if a hole larger than the conduit is pre-drilled and the conduit is hand-installed.
4. Jacking or drilling pits shall be at least two (2) feet from the edge of any type of any pavement, measured from the side of the pit nearest to the pavement.

3.02 FIELD QUALITY CONTROL

A. Tolerances:

1. Installation to be sound, tight, and true to line and grade.
2. Allowable tolerance as to grade and alignment of the installed casing shall not exceed 1/10 of a foot per hundred feet of casing length.

3.03 SCHEDULE

A. As shown on Drawings.

END OF SECTION

SECTION 33 12 01

WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Pipes, Materials, Valves, and Appurtenances for buried potable water service or uses as scheduled.
- B. Installation.

1.02 RELATED WORK

- A. Section 33 05 23.01 – Jacking and Boring
- B. Section 01 35 33.01 - Disinfection of Domestic Water Systems

1.03 REFERENCES

- A. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) pressure Pipe and Fittings for Water.

1.04 GENERAL REQUIREMENTS

- A. Pipes, fittings, and materials to be new.
- B. Use appropriate equipment and methods for unloading, reloading, hauling and laying pipe as well as proper trench excavation. Use slings with broad, well padded contact surfaces for pipe protection.
- C. All pipe of the same type shall be made by the same manufacturer. All fittings of the same type shall be made by the same manufacturer. Pipe manufacturer need not be the same as the fittings manufacturer.
- D. Provide labor, equipment, and materials for pipe field testing.

1.05 QUALITY ASSURANCE

- A. PVC Pipe and Fittings:
 - 1. Tests: ASTM D3034, AWWA C900, AWWA C905, ASTM D 1784, and ASTM D 1785, as applicable.
 - 2. Marking: Indelible, in each pipe.
 - a. Nominal pipe diameter and cell classification.
 - b. Manufacturer's name or trade name, PVC, ASTM and SDR designation,

- AWWA pressure class, and date of production.
 - c. Service designation.
 - d. NSF-61 certified.
3. Gasket rings: Marked with the manufacturer's identification, size, year of production, and classes of pipe in which they are to be used.

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Polyvinyl Chloride (PVC):

1. Pipe and Fittings:
 - b. Pipe sizes 14-inch through 36-inch:
 - AWWA C905
 - Pressure rating as scheduled; Class 165 psi (DR 25) minimum if not scheduled otherwise.
 - Fittings: Cast from ductile iron; AWWA C110, full body or C153, short body; mechanical joint AWWA C111, external mechanical restraint devices as specified herein. Encase fittings with polyethylene encasement per AWWA C105.
 - c. Pipe sizes 4-inch through 12-inch:
 - 1) AWWA C900.
 - 2) Pressure class as scheduled; Class 235 psi (DR 18) minimum if not scheduled otherwise.
 - 3) Fittings: Cast from ductile iron; AWWA C110, full body or C153, short body; mechanical joint AWWA C111, external mechanical restraint devices as specified herein. Encase fittings with polyethylene encasement per AWWA C105.
 - d. Pipe sizes 3.5-inch and smaller:
 - 1) Unless otherwise scheduled or shown on the Drawings.
 - a) ASTM D2241.
 - b) 1.5-inch and smaller: SDR 21.
 - c) 2-inch through 3.5-inch: SDR 26
 - d) Pressure rating as scheduled; 160 psi minimum if not scheduled.
 - 2) If scheduled or shown on the Drawings:
 - a) Schedule 40 and 80 Pipe Dimensions and Workmanship: ASTM D1785.
 - b) Schedule 40 minimum unless otherwise scheduled or shown on Drawings.
 - c) Material: ASTM D 1784, Class 12454-B.
 - d) Fittings:
 - i. ASTM D 2466, Schedule 40.
 - ii. ASTM D 2464, Schedule 80, threaded.
 - iii. ASTM D 2467, Schedule 80, socket type.

2. Joints
 - b. Gasket Bell End: ASTM D31139 for plastic pressure pipes using elastomeric seals.
 - c. Gaskets: ASTM F477, elastomeric.
 - d. Solvent Cement Bell End: ASTM D2672.
 - e. Solvent-Cement: ASTM D2564, NSF approved.
 - 1) Use only where specifically scheduled, shown on Drawings or approved by Engineer.
3. Joint Restraint: Furnish external mechanical restraint devices, including restrained flange adaptors as specified herein, or integral joint restraints for buried joints is specified herein. Furnish restraint devices where scheduled, noted on Drawings, and where specified in Part 3 of this specification.

B. Couplings:

1. Use only where indicated on Drawings or approved by Engineer. Do not use where restrained fittings are specified.
2. For buried service, furnish factory-applied fusion-bonded epoxy coating in accordance with AWWA C213, and corrosion-resistant alloy bolts equivalent to Dresserloy.
3. Shall meet AWWA C219: Described by reference to couplings manufactured by Dresser Industries, Inc., Bradford, PA; equivalent couplings by Brico Industries, Atlanta, GA or by other manufacturers may be used:
 - f. Dresser Style 40 long couplings where long couplings are indicated.
 - g. Dresser Style 62 reducing couplings where reducing couplings are indicated.
 - h. Dresser Style 162 couplings for transition between different pipe materials.
 - i. Dresser Style 63 expansion coupling where expansion coupling is indicated; type as indicated on Drawings or scheduled.
 - j. Dresser Style 227 and 128 coupling with flanged adaptor where indicated on Drawings.
 - k. Dresser Style 131 dismantling joint.

2.02 APPURTENANCES

A. Fire Hydrants:

1. Latest revision of AWWA C-502.
2. Mueller A-423 Super Centurion 250 or Engineer approved equivalent.
3. 1-1/2" Pentagon Bronze Operating Nut equipped with elastomer weather seal between the top casting and the operating nut.
4. Sealed oil reservoir will incorporate a system of forced lubrication of the thrust collar area each time the hydrant is operated.
5. Two 2.5 inch and one 4.5 inch nozzles with National Standard fire hose threads mechanically connected into the barrel, "O"-ring sealed and standard nozzle caps.

6. Steel safety stem coupling with stainless steel fasteners, and two-piece break away safety flange.
7. Centerline of hose nozzle will be a minimum of 18" above groundline.
8. 5-1/4" diameter main valve opening.
9. Upper valve plate shall be all bronze.
10. All internal surfaces of the shoe, the lower valve plate, and cap nut shall be coated with a factory applied two-part, thermosetting epoxy coating with a minimum thickness of 4 mils.
11. The bronze valve seat shall be threaded into a bronze drain ring or shoe bushing. The drain channel shall be all bronze.
12. The hydrant shall have two drain outlets above the lower flange of the hydrant shoe assembly.
13. 250 psi working pressure, and be certified as such by the manufacturer.
14. Lower barrel to shoe connection shall have a minimum of six (6) bolts made of stainless steel.
15. All hydrants furnished shall have a standard 10-year warranty certified by the manufacturer.
16. Painted chrome yellow.

B. Offset Fire Hydrant Connector Pipe:

1. Joints: Fully restrained by means of split M J Glands.
2. Length and Offset: To suit field conditions.
3. Material: DIP, AWWA C153.
4. Interior Lining: Cement mortar AWWA C104.

C. Tapping Sleeves:

1. Minimum working pressure: 150 psi.
2. Welded, fabricated A-36 steel body with the following features:
 - a. Fusion bonded epoxy coating, minimum of 8 mils thick.
 - b. Buna-N rubber gaskets.
 - c. Stainless steel bolts and nuts.
 - d. Flat face steel flange per AWWA C207.
3. Ford FTSC, Smith-Blair CC-622, Romac FTS 420, or Engineer approved equivalent.
4. Sizes as shown on Drawings.

D. Tapping Valves:

1. Minimum working pressure: 150 psi.
2. Sizes as shown on Drawings.
3. Mueller Type A-2360 Resilient Wedge Gate Valve; Mechanical Joint on outlet side and Flange End on opposite side, or Engineer approved equivalent.
4. AWWA C509.

5. AWWA C550 and NSF-61 certified epoxy coating on all interior and exterior ferrous metal surfaces 10 mils nominal thickness.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install as indicated on Drawings.
2. Trenching, Backfilling, and Compacting: Section 31 23 33 – Trenching and Backfilling.
3. Pipe cutting measurement taken at site.
4. Clean all pipe, accessories, and appurtenances before use. Thoroughly clean interior of each section of pipe after installing it in trench.
5. Securely close the end of the pipe at the end of each day or whenever the work ceases with a watertight seal.
6. Take precautions necessary to prevent uplift and floating of the pipe prior to backfilling.

B. Jointing and Assembling, General:

1. Manufacturer's recommendations.
2. Lubricants: Vegetable soap solution suitable for use on potable water systems.
3. Prevent entrance of soil and other contaminants.
4. Use mechanical or push-on for exterior locations.

C. Delivery, Handling, and Storage of PVC Pipe

1. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.
2. Inspect each pipe shipment prior to unloading to see if the load has shifted or otherwise been damaged. Notify Engineer immediately if more than immaterial damage is found. Check each pipe shipment for quantity and proper pipe size, color and type.
3. Off-load and handle pipe in accordance with AWWA M23 and AWWA C605, and all of the Pipe Supplier's guidelines.
4. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
5. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
6. Lower pipe from trucks carefully. Do not drop pipe.
7. Mark as rejected and remove at once from the work any pipe showing a crack or which has received a blow that could have caused an incident fracture, even though no such fracture can be seen.
8. Any scratch or gouge greater than 10 percent of the wall thickness will be considered significant and shall be rejected unless determined acceptable by the

Engineer.

9. Store and place pipe lengths on level ground. Store pipe at the job site in the unit packaging provided by the Pipe Supplier. Exercise caution to avoid compression, damage, or deformation to the ends of the pipe. Keep the interior of the pipe, as well as all end surfaces, free from dirt and foreign matter.
10. Handle and support pipe using woven fiber pipe slings or approved equivalent. Exercise care when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
11. If pipe is to be stored for periods longer than 30 days, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe shall be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
12. Store and stack pipe in accordance with Pipe Supplier's guidelines.

D.

PVC Pipe Joint Assembly:

1. Conformance to AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water:
 - a. Assemble PVC pipe in conformance with AWWA C605, section 5.5.2-Joint Assembly, which states,
“Pipe spigot ends are pre-marked at the factory with a circumferential insertion line. This line references how far the spigot should be inserted into the adjoining PVC pipe bell. Field-cut spigot ends shall be marked and beveled to match the manufacturer's insertion line. After assembly, the insertion line shall remain visible and be nearly flush with the lip of the adjoining PVC pipe bell. Joints assembled beyond the insertion line shall be considered over-assembled and may result in damaging stresses or leakage.”
2. Field Quality Control to Prevent Over-Assembly (Over-Insertion)
 - a. If a joint is found to be over-inserted, Contractor shall expose previously assembled joints until properly assembled joints are found. All over-inserted joints shall be properly re-assembled.
 - b. Contractor is permitted to use mechanical bell stop devices that meet the following criteria:
 1. Designed specifically to handle pip insertion forces to prevent insertion beyond the marked insertion line.
 2. Incorporates a resilient expansion retention spring that allows for pipe expansion and contraction.
 3. Ebaa Iron Mega-Stop™ series 5000 Bell Protection System, or Engineer approved equivalent.

E.

PVC Pipe Tapping:

1. Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C 605 and as specified herein. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping in accordance with Uni-Pub-08.

2. All connections requiring a larger diameter than that recommended by the Pipe Supplier, shall be made with a pipe connection as specified and indicated on the Drawings.
3. Equipment used for tapping shall be made specifically for tapping PVC pipe:
 - a. Tapping bits shall be slotted "shell" style cutters, specifically made for heavy-walled PVC pipe and designed to retain the coupon. "Hole saws" made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
 - b. Manually operated or power operated drilling machines may be used.
4. Taps may be performed while the pipeline is filled with water and under pressure ("wet" tap,) or when the pipeline is not filled with water and not under pressure ("dry" tap).

F. Clean all lines by repeated flushings after installations.

G. Pipe Sleeves:

1. For all pipes passing through concrete or masonry.
2. Install before concrete is placed where practical.
3. Sleeve seal: Watertight, modular sealing element when sleeve is placed in slabs with one side against soil.

H. Buried Pipe Anchorage:

1. Furnish and install thrust blocking, anchors, joint restraint devices, or other acceptable means of preventing pipe movement whether indicated or not for:
 - a. Unplugged bell and spigot or all unflanged tees.
 - b. Y branches.
 - c. Bends deflecting 22-1/2° or more.
 - d. Plugs.
 - e. Fittings in fills or unstable ground.
 - f. Above grade or exposed piping.
2. Concrete thrust blocking:
 - a. Install so joints are accessible for repair.
 - b. Install as shown on Drawings for buried pipe unless otherwise scheduled or approved by Engineer/Owner.
 - c. Use bond breaker, such as 8 mil polyethylene sheets, between concrete and surfaces of all piping, fittings, and appurtenances.

I. Valves: Installed as shown on drawings with valve boxes and blocking.

J. Fire Hydrants: As indicated on Drawings with concrete supports.

3.02 FIELD QUALITY CONTROL

A. AWWA C600 for ductile iron pipe, except as specified herein.

B. AWWA C605 for pressure rated PVC pipe and fusible PVC pipe, except as specified

herein.

- C. All pipes and fittings tested in presence and to the satisfaction of the Engineer.
- D. Test Conditions:
1. Working Pressure: See Schedule.
 2. Medium: Water.
 3. Unless otherwise scheduled, perform test at 50% greater than working pressure, or 150 psi, whichever is greater, for two hour minimum.
- E. Procedure:
1. Disconnect fixtures, equipment and accessories which may be damaged by test pressure.
 2. Plug ends as required.
 3. No installation will be accepted unless the leakage is less than the number of gallons per hour as determined by the following formula.
- $$L = (N) (D) (P)^{0.5} / 133,200$$
- Where
- L= allowable leakage in gallons per hour.
 - N = length of pipeline tested in feet.
 - D = nominal diameter of pipe in inches.
 - P = average test pressure during test, psig.
4. If leakage is indicated, locate and repair leaks.
 5. Retest repaired joints, pipes, and fittings until system complies with above criteria for allowable leakage.

3.03 SCHEDULE

- A. 12" Carrier Pipe Inside Casing: 12" ductile iron pipe, Class 350, with integral joint restraint.
- B. 12" Pipe: 12" DR 18 PVC pipe, AWWA C900, Class 235 psi, Blue.
- C. 8" Pipe: 8" DR 18 PVC pipe, AWWA C900, Class 235 psi, Blue.
- D. 6" Pipe: 6" DR 18 PVC pipe, AWWA C900, Class 235 psi, Blue.
- E. Fittings: DIP fittings, polyethylene encased, as shown on Drawings.

SECTION 33 30 00

SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section specifies materials and procedures for construction of outside, underground sanitary sewer systems that are complete and ready for operation. This includes piping, structures and all other incidentals.

1.02 RELATED WORK

- A. Trenching and Backfilling: Section 31 23 33
- B. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- C. Erosion and Sediment Control: Section 01 57 00, TEMPORARY ENVIRONMENTAL CONTROLS.

1.03 ABBREVIATIONS

- D. PVC: Polyvinyl chloride plastic

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store plastic piping protected from direct sunlight and support to prevent sagging and bending. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.
- B. Handle manholes according to manufacturer's written rigging instructions.

1.05 COORDINATION

- A. Coordinate connection to sanitary sewer main with Public Utility company. Contractor to obtain approval from the Public Agency that the existing sanitary sewer systems have the capacity to handle the discharge from the facility.
- B. Coordinate exterior utility lines and connections to building lines up to 5 feet of building wall.
- C. Coordinate connection to public sewer system with Public Utility Company.

1.06 QUALITY ASSURANCE:

- A. Products Criteria:
 - 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
 - 2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Sanitary Sewer lines and the extension, and/or modifications to Public Utility Systems.

1.07 SUBMITTALS:

- A. Manufacturers' Literature and Data shall be submitted for the following as one package:
 - 1. Pipe, Fittings, and, Appurtenances.
 - 2. Jointing Material.
 - 3. Manhole and Structure Material.
 - 4. Frames and Covers.
 - 5. Steps and Ladders.
 - 6. Gate Valves.
 - 7. Valve Boxes.
 - 8. Check Valves.
 - 9. Air Release Valves.

1.08 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):

A74-09 Cast Iron Soil Pipe and Fittings

A185/A185M-07 Steel Welded Wire Reinforcement, Plain, for Concrete

A615/A615M-09b	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
C478-09	Precast Reinforced Concrete Manhole Sections
C857-11	Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
C890-11	Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
C913-08	Precast Concrete Water and Wastewater Structures
C923-08	Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C924-02(2009).....	Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
C990-09	Joints for Concrete Pipe, Manholes, and precast Box Sections using Preformed Flexible Joint Sealants
C1173-10	Flexible Transition Couplings for Underground Piping Systems
C1440-08	Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems
C1460-08	Shielded Transition Couplings for Use With Dissimilar DWV Pipe and Fittings Above Ground
C1461-08	Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing systems for Above and below Ground Use
D2321-11	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D3034-08	Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

F477-10.....	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679-08.....	Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
F891-10.....	Coextruded Poly(vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
F949-10.....	Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
F1417-11.....	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
F1668-08.....	Construction Procedures for Buried Plastic Pipe

C. American Water Works Association (AWWA):

C219-11	Bolted, Sleeve-Type Couplings for Plain-End Pipe
C512-07	Air Release, Air/Vacuum and Combination Air Valves for Water Works Service
C600-10	Installation of Ductile-Iron Mains and Their Appurtenances
C900-07	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution

D. American Society of Mechanical Engineers:

A112.14.1–2003	Backwater Valves
A112.36.2M-1991	Cleanouts

1.09 WARRANTY

- A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of two years from final acceptance. Further, the Contractor will provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. All pipe and fittings used in the construction of force mains shall be rated to meet the system maximum operating pressure with a minimum of 150 psi (1035 kPa).
- C. The Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.02 PVC, GRAVITY SEWER PIPE AND FITTINGS

- A. PVC Gravity Sewer Piping:
 - 1. Pipe and Fittings shall conform to ASTM D3034 or ASTM F679.
 - 2. Gaskets: ASTM F477.
- B. PVC Cellular-Core Sewer Piping:
 - 1. Pipe and Fittings: ASTM F891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
 - 2. Fittings: ASTM D3034 ASTM F679 SDR 35 SDR 26.

2.03 PVC, PRESSURE PIPE AND FITTINGS

- A. PVC:
 - 1. Pipe: AWWA C900.
 - 2. Fittings: AWWA C900.
 - 3. Gaskets: ASTM F477.

2.04 GRAVITY FLOW LINES WITH SECONDARY CONTAINMENT (ENCASEMENT)

- A. Piping systems conveying hazardous materials shall be constructed with a watertight primary (carrier) pipe completely enclosed within a watertight secondary (containment) pipe.
- B. Piping and fittings shall be as per ASTM D3034 .
- C. The carrier pipe shall be installed with manufactured spacers to maintain a minimum interstitial space of 0.75 inch (19 mm) between the carrier pipe and the containment pipe.

- D. The encasement piping shall be equipped with adequate monitoring ports and vents to detect the presence of fluids within the containment pipe and for the extraction of fluids from the containment pipe.
- E. Encasement pipe shall be bell and spigot with adhesive bond.

2.05 PVC PRESSURE (FORCE) MAIN:

- A. Joints shall be fully restrained with mechanical joints, capable of restraining 50 percent above all loads acting on the joint, but not less than 150 psi (1035 kPa). Thrust blocks shall not be permitted.
- B. Polyvinyl Chloride (PVC) Pipe and Fittings:
 - 1. Pipe: ASTM D3034, SDR 35.
 - 2. Gaskets: ASTM F477.

2.06 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C1173, elastomeric, sleeve type, reducing or transition coupling, for joining underground nonpressure piping. Include ends to match same sizes of main line piping and install corrosion-resistant metal tension bands and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Plastic Pipes: ASTM F477, elastomeric seal.
 - 2. For Dissimilar Pipes: PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 - 1. Couplings shall be elastomeric sleeve with //stainless steel shear ring and // corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
 - 1. Couplings shall meet ASTM C1460 with elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield with corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
 - 1. Couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger mainline pipe and for spigot of smaller main line pipe to fit inside ring.
- F. Nonpressure-Type, Rigid Couplings:

1. Couplings shall be ASTM C1461 with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.07 PRESSURE-TYPE PIPE COUPLINGS

- A. Tubular-Sleeve Couplings:
 1. Couplings shall meet AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
- B. Metal, bolted, sleeve-type, reducing or transition couplings for joining underground pressure piping:
 1. Couplings shall meet a minimum pressure rating and ends of same sizes of the main line piping.
- C. Center-Sleeve Material:
 1. Sleeve shall be Manufacturer's standard .
- D. Gasket material: Gaskets shall be natural or synthetic rubber.
- E. Metal component finish: Finish shall be a corrosion-resistant material or coating.

2.08 EXPANSION JOINTS AND DEFLECTION FITTINGS

- A. Ductile-Iron, Flexible Expansion Joints:
 1. Compound fittings: Fittings shall have a combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153.
- B. Ductile-Iron Expansion Joints:
 1. Jointing Material: Joints shall be a three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psi (1725-kPa) minimum working pressure and for expansion indicated.
- C. Ductile-Iron Deflection Fittings:
 1. Jointing Material: Compound coupling fittings with ball joint, flexing section, gaskets, and restrained-joint ends shall comply with AWWA C110 or AWWA C153. Include rating for 250-psi (1725-kPa) minimum working pressure and for up to 15 deg of deflection.

2.09 BACKWATER VALVES

- A. Cast-Iron Backwater Valves:

1. Valve Material: Valve shall be as per ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
2. Horizontal valve will include a swing check valve and hub-and-spigot ends.
3. Valve will include a swing check valve, integral gate valve, and hub-and-spigot ends.
4. Valve will include a bronze seat, swing check valve, and hub inlet.
- B. PVC Backwater Valves:
 1. PVC valve shall be a horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.10 CLEANOUTS

- A. PVC Cleanouts:
 1. PVC body with PVC threaded plug: Cleanout shall be as per ASTM D3034. PVC sewer pipe fitting and riser to cleanout.
 2. Cleanout Riser: Sewer pipe fitting on main line sewer and riser shall match main line piping.

2.11 MANHOLES

- A. Standard precast concrete manholes and vaults shall be constructed of precast concrete segmental blocks, precast reinforced concrete rings, precast reinforced sections or cast-in-place concrete.
 1. Precast Concrete Manholes: Material shall be as per ASTM C478, precast, reinforced concrete, of depth indicated, with sealed joints.
 2. Concrete Base: Concrete for base of manhole shall have a minimum compressive strength of 5000 psi (35 MPa) at 28 days. Thickness to be 8 inches (200 mm), minimum.
 3. Riser Section: 4 inch (100 mm) minimum thickness, of lengths to provide the total depth of manhole.
 4. Top Section: Eccentric-cone type unless otherwise indicated. Top section to match adjustment ring configurations.
 5. Joint Sealant: ASTM C990.
 6. Resilient Pipe Connectors: ASTM C923.
 7. Adjusting Rings: Reinforced-concrete rings; 6 to 9 inch (150 to 225 mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.
- B. Designed Concrete Manholes:

1. Description: ASTM C913; designed according to ASTM C890 for AASHTO HS20-44, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
5. Adjusting Rings: Reinforced-concrete rings; 6 to 9 inch (150 to 225 mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.
- C. Manhole Base Channels: Manhole channels shall be main line pipe material. Lay main pipe through manhole and cut top of pipe out to be three-fourths of pipe diameter. Slope through manhole to match run slopes of the main pipe.

2.12 CONCRETE

- A. Cast-in-place concrete shall be 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
- B. Reinforcement
 1. Reinforcing fabric shall be ASTM A185, steel, welded wire fabric, plain.
 2. Reinforcing bars shall be ASTM A615, Grade 60 (420 MPa) deformed steel.
- C. Benches shall be concrete, sloped to drain into the channel. Provide 6 inches (150 mm) from the cut section of top of pipe to edge of manhole.
- D. Ballast and Pipe Supports shall be Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

2.13 WET WELL

- A. Fiberglass wet well. Tank shall be a single wall fiberglass reinforced plastic (FRP) UL labeled underground storage tanks as shown on the drawings. Size and fittings shall be as shown on drawings.
- B. Concrete Wet Well:
 1. Concrete wet well shall be a circular precast vault conforming to ASTM C857.

2. Vault Material: The vault shall have a poured concrete base with precast walls, and top poured in place structure.
 3. Concrete: Concrete shall be 5000 psi (35 MPa) concrete at 28 days.
 4. Design Load: The vault shall be rated for AASHTO HS20-44 loading and 30 percent impact loads.
 5. Joints: Joints in the vault shall be tongue and groove. Flexible sealing compound, as recommended by the manufacturer, shall be placed in all joints to form a watertight structure.
 6. Interior Coating: Concrete coating for the interior of wet wells shall consist of an epoxy blended filler sealer, and a cross linked epoxy phenolic cured, resistant protective coating.
- C. Tank Design Criteria:
1. Internal Load: Tank shall withstand without leakage a 5 psi (34.5 kPa) air pressure test with 5 to 1 safety factor. Contractor shall test prior to installation as this is to test for leakage.
 2. Vacuum Test: The tank shall be tested to 11.5 inches (292 mm) of mercury vacuum by the tank manufacturer to assure structural integrity. Contractor shall submit vacuum test certificate if test conducted by manufacturer at plant.
 3. Surface Loading: Tank shall withstand surface AASHTO HS20-44 axle loads.
 4. External Hydrostatic Pressure: Tank shall withstand 7 feet (2.1 m) of overburden with the hole fully flooded with a 3 to 1 safety factor against leaking.
 5. Threaded fittings shall be of a material consistent with the requirements of the UL label and be of the sizes and locations shown on the drawings.
 6. Tanks shall have nominal capacity as shown on drawings with a minimum of a 36 inch square (900 mm) ID manway riser, a complete cast iron frame and lid at finish grade, steps, and lid that is spring loaded.

2.14 AIR RELEASE VALVE FOR FORCE MAINS

- A. Valves shall be combination air release and vacuum valve with a single body. The valves shall be rated for 150 psi (1025 kPa) working pressure, and conform to AWWA C512. Valve shall be provided with threaded connections, and be mounted on a full opening ball valve to isolate the air release valve from the system.

2.15 WARNING TAPE

- A. Warning tape shall be standard, 4 mil (0.1 mm) polyethylene 3 inch (76 mm) wide tape green with black letters and imprinted with "CAUTION BURIED SEWER LINE BELOW".

PART 3 EXECUTION

3.01 PIPING INSTALLATION

- A. Drawing plans and details indicate the general location and arrangement of underground sanitary sewer piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at the low point, true to grades and alignment indicated on the drawings, with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.
- D. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.
- E. Inspect pipes and fittings for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.
- F. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.
- G. Do not walk on pipe in trenches until covered by layers of bedding or backfill material to a depth of 12 inches (300 mm) over the crown of the pipe.
- H. Warning tape shall be continuously placed 12 inches (300 mm) above sewer pipe
- I. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- J. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.
- K. Install gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
- L. Install force-main, pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fittings, or

cast-in-place-concrete supports or anchors. Pressure (force) mains shall have the bells facing the direction of flow.

2. Sections of piping listed on the drawings shall be fully restrained. For devices with twist off nuts, the twist off nuts shall be placed on top of the fitting for the Resident Engineer's inspection. The Contractor shall torque test all bolts, set screws, identified by the Resident Engineer.
3. Thrust blocks shall not be permitted.

M. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

N. Gravity Flow Lines with Secondary Containment (Encasement Pipe):

1. Install per manufacturer's recommendations. Install all pipe centering devices to maintain an interstitial space below the invert of the carrier pipe. Both the carrier and containment pipe shall be tested for leaks.

3.02 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure, drainage piping according to the following:
 1. Join PVC piping according to ASTM D2321.
 2. Join dissimilar pipe materials with nonpressure-type, // flexible // or rigid // couplings.
- B. Join force-main, pressure piping according to the following:
 1. Join PVC pressure piping according to manufacturer's recommendations.
 2. Join dissimilar pipe materials with pressure-type couplings.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
 2. Unshielded couplings for pipes of same or slightly different OD.

3.03 SEWER AND MANHOLE SUPPORTS, CONCRETE CRADLES WITHIN VAULTS

- A. Install reinforced concrete as detailed on the drawings. The concrete shall not restrict access for future maintenance of the joints within the piping system.

3.04 MANHOLE INSTALLATION

- A. Install manholes complete with appurtenances and accessories indicated.
 - 1. Precast concrete segmental blocks shall lay true and plumb. All horizontal and vertical joints shall be completely filled with mortar. Parge interior and exterior of structure with 1/2 inch (15 mm) or cement mortar applied with a trowel and finished to an even glazed surface.
 - 3. Precast reinforced concrete rings shall be installed true and plumb. The joints between rings and between rings and the base and top, shall be sealed as per manufacturer's recommendations. Adjust the length of the rings so that the top section will be at the required elevation. Cutting the top section is not acceptable.
 - 4. Concrete manhole risers and tops: Install as specified.
- B. Designed Concrete Structures:
 - 1. Concrete structures shall be installed in accordance with Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Do not build structures when air temperature is 32 deg F (0 deg C), or below.
- D. The wall that supports access rungs or ladder shall be 90 deg vertical from the floor of structure to manhole cover.
- E. Install steps and ladders per the manufacturer's recommendations. Steps and ladders shall not move or flex when used. All loose steps and ladders shall be replaced by the Contractor.
- F. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. In unpaved areas, the rim elevation shall be 2 inches (50 mm) above the adjacent finish grade.
- G. Install manhole frames and covers on a mortar bed, such that frames and covers shall not move when subject to vehicular traffic. Install a concrete collar around the frame to protect the frame from moving until the adjacent pavement is placed. Install an 8 inches (200 mm) thick, by 12 inches (300 mm) wide concrete collar around the perimeter of the frame. Slope the top of the collar away from the frame.

3.05 CONNECTIONS

- A. Make connections to existing piping and underground manholes by coring and installing the pipe at the design invert. Install an elastomeric gasket around the pipe, and grout the interstitial space between the pipe and the core.
- B. Connection to an existing manhole: The bench of the manhole shall be cleaned and reshaped to provide a smooth flowline for all new pipes connected to the manhole.

- C. Use commercially manufactured wye fittings for piping branch connections. Encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
1. Make branch connections from the side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500), by removing a section of the existing pipe.
 2. Make branch connections from the side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting an opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in concrete to provide additional support of collar from connection to undisturbed ground.
 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.06 REGRADING

- A. Raise or lower existing manholes and structures frames and covers, cleanout frames and covers and valve boxes in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Adjust the elevation of the cleanout pipe riser, and reinstall the cap or plug. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.
- B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.07 CLOSING ABANDONED SANITARY SEWER SYSTEMS

- A. Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed.
1. Piping under and within 5 feet (1500 mm) of building areas shall be completely removed.

2. Piping outside of building areas shall // be completely removed // plugged with concrete, and abandoned in-place //.
- B. Excavate around manholes as required and use either procedure below:
 1. Manholes and structures outside of building areas: Remove frame and cover, cut and remove the top of an elevation of 2 feet (600 mm) below finished grade. Fill the remaining portion with compacted gravel or crushed rock or concrete.
 2. Manholes and structures with building areas: Remove frame and cover and remove the entire structure and the base.
- C. Backfill to grade according to Division 31 Section 31 20 00, EARTH MOVING.
- D. When the limit of the abandonment terminates in an existing manhole to remain, the flow line in the bench of the manhole to the abandoned line shall be filled with concrete and shaped to maintain the flowline of the lines to remain.

3.08 PIPE SEPARATION

- A. Horizontal Separation - Water Mains and Sewers:
 1. Existing and proposed water mains shall be at least 10 feet (3 m) horizontally from any proposed gravity flow and pressure (force main) sanitary sewer or sewer service connection.
 2. Gravity flow mains and pressure (force) mains may be located closer than 10 feet (3 m) but not closer than 6 feet (1.8 m) to a water main when:
 - a. Local conditions prevent a lateral separation of 10 feet (3 m); and
 - b. The water main invert is at least 18 inches (450 mm) above the crown of the gravity sewer or 24 inches (600 mm) above the crown of the pressure (force) main; and the water main is in a separate trench separated by undisturbed earth.
 3. When it is impossible to meet (1) or (2) above, both the water main and sanitary sewer main shall be constructed of push-on or mechanical joint ductile iron pipe.
- B. Vertical Separation - Water Mains and Sewers at Crossings:
 1. Water mains shall be separated from sewer mains so that the invert of the water main is a minimum of 24 inches (600 mm) above the crown of gravity flow sewer or 48 inches (1200 mm) above the crown of pressure (force) mains. The vertical separation shall be maintained within 10 feet (3 m) horizontally of the sewer and water crossing. When these vertical separations are met, no additional protection is required.
 2. In no case shall pressure (force) sanitary main cross above, or within 24 inches (600 mm) of water lines.

3. When it is impossible to meet (1) above, the gravity flow sewer may be installed 18 inches (450 mm) above or 12 inches (300 mm) below the water main, provided that both the water main and sewer shall be constructed of push-on or mechanical ductile pipe. Pressure (Force) sewers may be installed 24 inches (600 mm) below the water line provided both the water line and sewer line are constructed of ductile iron pipe.
4. The required vertical separation between the sewer and the water main shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer line is at least 10 feet (3 m).

3.09 IDENTIFICATION

- A. Install green warning tape directly over piping and at outside edges of underground manholes.

3.10 FIELD QUALITY CONTROL

- A. All systems shall be inspected and obtain the Resident Engineer's approval. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.
- B. To inspect, thoroughly flush out the lines and manholes before inspection. Lamp test between structures and show full bore indicating sewer is true to line and grade. Lips at joints on the inside of gravity sewer lines are not acceptable.
 1. Submit separate report for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Re-inspect and repeat procedure until results are satisfactory.

SECTION 40 27 02.09

MISCELLANEOUS VALVES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install all miscellaneous valves specified herein.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Same manufacturer for each type of valve throughout where practical.
- B. Manufacturer's name or initials and working pressure ratings cast on valve body.

2.02 DESIGN REQUIREMENTS

- A. General: Unless otherwise indicated, use valves suitable for 125 minimum psi WOG and 150 degrees F.
- B. Air/Vacuum and Air Release Valves
1. Water Service:
 - a. Operating pressure below 150 psi, unless otherwise scheduled or shown on Drawings.
 - b. Body, cover, and baffle: Cast iron.
 - c. Float: Stainless steel.
 - d. Seat: Buna-N or Viton.
 - e. 3-inch and smaller: NPT threaded outlet.
 - f. 4-inch and larger: Plain outlet with steel protector hood.
 - g. Piping Appurtenances: Inlet gate valve and vent return leg piping, unless shown otherwise on Drawings.
- C. Solenoid Valve
1. Brass body, unless otherwise scheduled, pilot operated.
 2. Solenoid enclosure: Type 6 Submersible/Watertight.
 3. 120 VAC unless otherwise indicated on Drawing or scheduled.
 4. ASCO Series 8210 or Engineer approved equivalent.
- D. Plug Drain valves (Mud Valves):
1. Flanged end.
 2. Non-rising stem.

- F. Fire Hydrants
- G. External Mechanical Restraint Devices
- H. Design Pressure Schedule:
 - 1. Working Pressure: 100 psi
 - 2. Field Test Pressure: 150 psi

END OF SECTION

- H. Valve Position Indicator for buried direct-drive valves:
1. Synchronized with the valve to match the valve's quarter turn travel from open to closed.
 2. Furnished with cast iron adaptor (riser) to facilitate installation within the valve box body.
 3. Indicator and adaptor specifically designed to allow removal of the indicator without requiring removal of the valve box adaptor.
 4. DeZurik indicator for ¼ turn actuated valve or Engineer approved equivalent.
 5. Designs which require removal of the valve box adaptor casting in order to remove the position indicator are not acceptable.

2.02 PROTECTIVE COATING

- A. Cast iron boxes: Factory painted inside and out with manufacturer's recommended asphalt paint.

PART 3 EXECUTION

3.01 INSTALLATION

- A. With concrete collar.
- B. Shall not bear on pipe or valve.

3.02 SCHEDULE

- A. Valve Boxes for all buried quarter-turn valves 4" or greater in size to include valve position indicators unless otherwise shown on Drawings.

END OF SECTION

SECTION 40 27 02.10

VALVE BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Boxes for all buried, manually operated valves.
- B. Box covers of markers.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. Cast iron, adjustable extension type, traffic type
- B. Minimum thickness of metal at any point: 3/16"
- C. Removable cast iron cover, 5-1/4" diameter standard drop lid, cast marking with words, "WATER", "SEWER", or "GAS" to match appropriate utility.
- D. Cast iron base properly sized to fit over valve bonnet and bear on bricks, as shown on Drawings.
 - 1. Base shall be large enough to extend 6 inches below bottom of valve operating nut.
 - 2. Base shall be large enough so no part of the base or its bearing bricks shall bear on any part of the valve.
- E. For valves on washwater and irrigation system only: Class 200 PVC pipe
- F. All valve boxes for valves scheduled to be equipped with valve position indicators shall be designed for integral installation of the position indicator.
- G. Valve Position Indicators for Buried Gear-Operated Valves:
 - 1. All gearing in a waterproof sealed unit.
 - 2. Synchronized with the valve to match the valve's required number of turns from open to close.
 - 3. Furnished with cast iron adaptor where required to facilitate installation within the valve box body.
 - 4. Furnish with 2" AWWA nut and 1-1/4" steel rod extension riser and socket to attach to valve nut.
 - 5. Henry Pratt DivinerTM, Dynatorque GPI-S, or Engineer reviewed equivalent.

of 450 ft.-lb.

- a) Valves 4" – 12": Slotted lever.
- b) Valves 14"-48": Link and lever.
- 3) Operator Rotation: Open left (counter-clockwise) unless scheduled otherwise.

2.03 PROTECTIVE COATING

- A. Factory enamel paint unless specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Manufacturer's recommendations.
- B. Per code or best trade or industry practice.
- C. As indicated on Drawings.

3.02 SCHEDULE

- A. As shown on Drawings.
- B. Air/Vacuum and Air Release Valves:
 - 1. Size: 2-inch
 - a. Type: Single Body Combination
 - b. Design Basis: Val-Matic, Model No. 202C.2
 - c. Quantity: As shown on Drawings.
 - 2. Size: 3-inch
 - a. Type: Single Body Combination
 - b. Design Basis: Val-Matic, Model No. 203C.2
 - c. Quantity: As shown on Drawings.
 - 3. Size: 4-inch
 - a. Type: Single Body Combination
 - b. Design Basis: Val-Matic, Model No. 204C.2
 - c. Quantity: As shown on Drawings
 - 4. Size: 6-inch
 - a. Type: Single body Combination
 - b. Design Basis: Val-Matic, Model No. 206C.2
 - c. Quantity: As shown on Drawings.

END OF SECTION

3. Cast iron bodies.
4. Bronze stem, operating nut, disc ring, and seat ring.
5. Similar to Eddy F-3075.

E. Gate Valves:

1. 3-inch or smaller:
 - a. Bronze body and wedge with threaded ends, non-rising stem; Grinnel or Engineer approved equivalent.
 - b. Pressure rating: 200 psi non-shock cold water, oil, or gas, unless otherwise scheduled or shown on Drawings.
 - c. Furnish gate valves for buried lines with valve key operator.
 - d. 4-inch or larger See 33 12 01 – Water Systems.

F. PVC ball Valves for Above-Ground Plastic Pipe Installations:

1. PVC construction with true union ends.
2. 150 psi at 73° F for 2.5" to 6".
3. 235 psi at 73° F for 0.5" to 2".
4. T-handle operator.
5. "O" Ring seals: FPM (Viton ®).
6. Ball Seat: P.T.F.E. (Teflon ®).

G. Butterfly Valves, Exposed Service:

1. Size: As indicated on Drawings.
2. Conformance: AWWA C504 Rubber-Seated butterfly Valves, pressure Class 250 B.
3. Lead-free materials in contact with water, as certified by the Water Quality Association to comply with NSF/ANSI 372.
4. NSF 61 certification.
5. Body: Short body flanged, ANSI Class 125 flange drilling, unless indicated otherwise on Drawings.
6. Working Pressure: 250 psig.
7. Materials of Construction:
 - a. Body: Cast iron or ductile iron.
 - b. Disc: cast iron or ductile iron.
 - c. Valve shaft: Type 304 stainless steel.
8. Resilient Seat: Buna-N (NBR) bonded seat in body.
9. Actuator:
 - a. Factory assembled with valve by valve manufacturer.
 - b. Lever Actuators: Furnish with valves up to 6-inch diameter, unless indicated otherwise on Drawings.
 - c. Handwheel Actuators: Furnish on 8-inch diameter and larger valves, conform to AWWA c504, unless indicated otherwise on Drawings and as specified herein.
 - 1) Size actuator such that the rim pull required to operate valve shall not exceed 40 lbs.
 - 2) Actuator Type: Traveling nut, capable of withstanding an input torque

APPENDIX A
TRENCHING GUIDELINES
NEW MEXICO DEPARTMENT OF GAME AND FISH

TRENCHING GUIDELINES

NEW MEXICO DEPARTMENT OF GAME AND FISH

September 2003

Open trenches and ditches can trap small mammals, amphibians and reptiles and can cause injury to large mammals. Periods of highest activity for many of these species include nighttime, summer months and wet weather. Implementing the following recommendations can minimize loss of wildlife.

- Keep trenching and back-filling crews close together, to minimize the amount of open trenches at any given time.
- Trench during the cooler months (October – March). However, there may be exceptions (e.g., critical wintering areas) that need to be assessed on a site-specific basis.
- Avoid leaving trenches open overnight. Where trenches cannot be back-filled immediately, escape ramps should be constructed at least every 90 meters. Escape ramps can be short lateral trenches or wooden planks sloping to the surface. The slope should be less than 45 degrees (1:1). Trenches that have been left open overnight should be inspected and animals removed prior to backfilling, especially where endangered species occur.

On a statewide basis there are numerous threatened, endangered or sensitive species potentially at risk by trenching operations. Project initiators should seek county species list to evaluate potential impact of projects. Risk to these species depends upon a wide variety of conditions at the trenching site, such as trench depth, side slope, soil characteristics, season, and precipitation events.

APPENDIX B

NEW MEXICO STANDARD SPECIFICATIONS FOR

PUBLIC WORKS CONSTRUCTION

SECTION 701 TRENCHING, EXCAVATION AND BACKFILL

701.1 GENERAL

Trench excavation and backfill for underground utilities, sanitary sewer, storm sewer, water lines, and appurtenances shall conform to these specifications or as specified in the Supplemental Technical Specifications or as authorized, in writing, by the ENGINEER.

701.2 REFERENCES

701.2.1 ASTM:

D-2487 D-2922

D-3017 D-4318

701.2.2 This Publication:

Section 207

Section 301

Section 302

Section 336

Section 337

Section 340

701.3 TERMINOLOGY

701.3.1 For the purpose of these specifications in this Section, the descriptive terms "flexible," "plastic" and "non-rigid" are similarly interchangeable as utilized in these specifications and appurtenant reference material.

701.3.2 Rigid pipe: shall be reinforced concrete, concrete cylinder, and vitrified clay pipes.

701.3.3 Flexible pipe shall be polyvinyl chloride, polyethylene, ductile iron, and corrugated metal pipes.

701.3.4 Standard Detail Drawings show the trench cross-sections which identify the meaning and limits of terminology used in these specifications for the terms "foundation, bedding, haunching, initial backfill, final backfill, embedment, pipe zone, cover, springline, and pipe width."

701.3.5 The Unified Soil Classification System in ASTM D2487 Shall be utilized for the purpose of material classifications. See Table 701.3.A for a listing of referenced soil classes.

701.4 NOTIFICATION OF FORTHCOMING WORK

701.4.1 To assure that the construction work progresses in a timely manner and that good public relations are maintained with the property owners, the following actions are considered essential:

D-422 D-698 D-1557 D-2321 701.4.1.1 Prior to the start of construction the CONTRACTOR shall assist the ENGINEER in notifying the adjacent property owners as to when construction will start, the estimated completion date, anticipated access blockages.

TABLE 701.3.A
EMBEDMENT SOILS CLASSIFICATIONS

SOILS CLASS	SOIL TYPE	DESCRIPTION
CLASS I SOILS*		Manufactured angular, granular material, ¼ to 1-1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells, complying to the requirements of Class II soils.
CLASS II SOILS** CLASS II SOILS** CLASS II SOILS** CLASS II SOILS**	GW GP SW SP	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more of coarse fraction retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more of coarse fraction retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Well-graded sands and gravelly sands, little or no fines. More than 50% of coarse fraction passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Poorly graded sands and gravelly sands, little or no fines. More than 50% of coarse fraction passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
CLASS III SOILS*** CLASS III SOILS*** CLASS III SOILS*** CLASS III SOILS***	GM GC SM SC	Silty gravels, gravel-sand-silt mixtures. 50% or more of coarse fraction retained on No. 4 sieve. More than 50% retained on No. 200 sieve. Clayey gravels, gravel-sand-clay mixtures. 50% or more of coarse fraction retained on No. 4 sieve. More than 50% retained on No. 200 sieve. Silty sands, sand-silt mixtures. More than 50% of coarse fraction passes No. 4 sieve. More than 50% retained on No. 200 sieve. Clayey sands, sand-clay mixtures. More than 50% of coarse fraction passes No. 4 sieve. More than 50% retained on No. 200 sieve.
CLASS IV SOILS CLASS IV SOILS CLASS IV SOILS CLASS IV SOILS	ML CL MH CH	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve. Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays, Liquid limit 50% or less. 50% or more passes No. 200 sieve. Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.

CLASS V SOILS CLASS V SOILS CLASS V SOILS	OL OH PT	Organic silts and organic silty clays or low plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve. Organic clays of medium to high plasticity. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. Peat, muck and other highly organic soils.
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* Soils are as defined in ASTM D2487, except for Class I Soil which is defined in ASTM D2321

** In accordance with ASTM D2487, less than 5% passes No. 200 sieve.

*** In accordance with ASTM D2487, soils with 5% to 12% passing No. 200 sieve fall in a borderline classification that is more characteristic of Class II than of Class III.

701.4.1.2 Prior to the start of trenching operations, including pavement cutting and removal, the CONTRACTOR should coordinate with the ENGINEER any problem areas and involving traffic control, access to private properties, stockpiling of excavated materials, and other utility conflicts.

701.4.1.3 The CONTRACTOR shall provide the ENGINEER with the name and telephone number of at least two contact persons during non-working hours.

701.5 TRENCH SAFETY

The CONTRACTOR shall be responsible for maintaining all trenches in a safe condition; thereby protecting the workers and the general public. Trench slopes and other protection shall be in accordance with applicable regulations such as the Department of Labor's Occupational Safety and Health Administration Standards 29CFR Part 1926, subpart P or any applicable amendments.

701.6 BRACING EXCAVATIONS

701.6.1 Excavation for pipe shall normally be by open unsupported trenches unless local conditions warrant trench bracing.

701.6.2 Excavations shall be braced and sheeted, to provide complete safety to persons working therein and bracing shall comply with applicable Federal (OSHA), State and local laws and ordinances. Support systems for trenches in excess of 20 feet deep and adjacent to existing improvement or subject to vibrations or ground water shall be in accordance with OSHA regulations. The CONTRACTOR shall be fully responsible for sufficiency and adequacy of bracing excavations with respect to work under construction and adjacent utility lines and private property.

701.6.3 If the soil conditions within the trench area require support, the CONTRACTOR may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, or movable trench shield to support the trench during pipe laying operations, such as: bedding preparation, pipe laying, backfilling of haunches and initial zone.

701.6.4 No sheeting shall be permitted to remain in the trench except when, in the opinion of the ENGINEER, field conditions or type of sheeting or methods of construction used by the CONTRACTOR, warrant the supports must remain. The ENGINEER may opt to have the lower portion (within the pipe zone) of the sheeting to remain. If the CONTRACTOR plans on removing the sheeting, he shall submit method to the ENGINEER for approval to treat the void created by the removal of the sheeting within the pipe zone and below.

701.6.5 When a movable trench shield is used, the trailing half of the shield should be notched to the height of the top of the pipe. This will allow the haunch area of the pipe to be compacted properly to the wall of the trench. If the trench shield is not notched, a subtrench shall be excavated for pipe installation such that the bottom of the trench shield does not enter the pipe zone.

701.7 DEWATERING

701.7.1 Trenching and pipe laying operations may encounter standing water or ground water which would preclude the proper placing of bedding, backfilling, and laying pipe. The water shall be removed by pumps and associated equipment, such as well points, to lower the water level. Dewatering shall continue for a minimum 24 hours after placement of any concrete.

701.7.2 Dewatering operations shall remove the water to achieve a stable foundation for pipe embedment and backfilling. The ENGINEER shall determine if adequate foundation has been attained. The ground water shall be lowered to a minimum depth of 6 inches below pipe grades. Should over excavation be necessary due to unsuitable foundation conditions, the ground water shall be additionally lowered as necessary.

701.7.3 The CONTRACTOR shall submit a plan for approval by the ENGINEER as to how and where the waste water will be disposed. Waste water will not be discharged into traffic and pedestrian lanes or onto private properties.

701.7.4 The CONTRACTOR shall obtain permit from the New Mexico State Engineer prior to commencing dewatering operations.

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701.7.5 The CONTRACTOR shall also be responsible for any adverse effect his dewatering operation has to private property, including providing temporary water to residences and/or business necessitated by the effect on private wells.

701.7.6 The CONTRACTOR shall arrange dewatering operation in a neat and orderly manner such that access to adjacent properties is maintained, the discharge system does not leak and that any power generation complies with applicable noise limit regulations.

701.8 REMOVAL OF EXISTING PAVEMENT SIDEWALK, AND DRIVEWAY

701.8.1 Existing concrete pavement, sidewalk, or driveway removed in connection with construction shall be replaced, neatly sawed edges. Cuts shall be neat and to true straight lines with no shatter outside the removal area. If a saw cut would fall within 30 inches of a construction joint, cold joint, expansion joint, or edge, the concrete shall be removed and replaced to the joint or edge. Concrete sidewalk and/or driveway may be removed so that a minimum of 30-inch square is replaced. If the saw cut would fall within 12 inches of a score mark, the score mark.

701.8.2 Existing bituminous pavement removed in connection with construction shall be cut with a saw, pavement break cutting wheel, or other suitable tool approved by the ENGINEER. Care shall be taken to assure that the edge of removed pavement does not vary from a straight line more than 2 inches from the mean.

701.8.3 Saw cutting shall be 1-1/2 inches in depth or 1/4 the thickness of the pavement, sidewalk, or driveway, whichever is greater. All saw cuts or other scoring shall be made perpendicular to the surface of the material to be cut.

701.8.4 Any unnecessarily irregular breakage or cracking caused by the CONTRACTOR shall be removed and replaced by the CONTRACTOR without added expense to the OWNER.

701.8.5 The CONTRACTOR shall be responsible for the disposal of removed materials.

701.8.6 Saw cutting is required on all concrete or asphalt paving on State maintained streets or roads.

701.8.7 Paving cuts for manholes and valve boxes and other utility appurtenances shall be square and at dimensions specified in the Standard Detail Drawings or on the construction plans.

701.9 MAXIMUM LENGTH OF OPEN TRENCH

In developed areas, no more than 300 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 advance of trenching operations in undeveloped areas, the CONTRACTOR shall submit in writing or on plans for the ENGINEER'S approval, the maximum length of trench that will be open at any one time. Except by permission of the ENGINEER, the maximum length of open trench in any one location where concrete structures are cast in place will be that which is necessary to permit uninterrupted progress. Construction shall be pursued as follows: excavation, formwork, and setting of reinforcing steel, placing of floor slab, walls, and cover slab or arch shall follow each other without any one of these operations preceding the next nearest operation by more than 200 feet. Failure by the CONTRACTOR to comply with the limitations specified herein or as may be specifically authorized by the ENGINEER may result in a written order from the ENGINEER to halt progress of the work until such time as compliance with this paragraph has been achieved and the work can be proceeded in an orderly sequence of operations.

701.10 WIDTH OF TRENCHES

Trench widths will vary according to the type of pipe used, size of pipe, depth of trench, and soil conditions. The minimum width requirements, indicated below, are for proper laying, aligning and jointing of pipe as well as trench grading, bedding preparation, and backfilling.

701.10.1 TRENCH WIDTH FOR RIGID PIPE MATERIALS: Trench widths from bottom of pipe to a point 12 inches above the top of the pipe shall be kept to the practical minimum required for properly laying, aligning, grading, jointing, and backfilling of the pipe, but no less width than pipe outside diameter plus 16 inches. For stable soils which will stand a vertical cut, the maximum trench width at a point 12 inches above the top of pipe or at a point 5 feet above the bottom of the trench, whichever is less, shall be as follows:

- The pipe outside diameter plus 2 feet for pipes 27 inches in diameter and smaller.
- 1.6 times the nominal diameter for pipes 30 inches in diameter or larger.

701.10.1.3 When soil will not stand vertical, the trench sides shall be sloped to provide not less than the outside diameter plus 16 inches at the pipe invert.

701.10.2 TRENCH WIDTH FOR NON-RIGID PIPES: The minimum clear width of the trench measured at the springline of the pipe should be 1 foot greater than the outside diameter of the pipe. The maximum clear width of the trench at a point 1 foot above the top of the pipe is equal to the pipe outside diameter plus 2 feet. If the maximum recommended

trench width must be exceeded or if the pipe is installed in a compacted embankment, then pipe embedment should be compacted to a point of at least 2-1/2 pipe diameters from the side of the pipe or to the trench walls.

701.11 ROCK EXCAVATION

701.11.1 Rock is defined as material which cannot be excavated without drilling and blasting. All stone or boulders less than 8 cubic feet in volume will be classified as earth; all larger boulders shall be classified as rock. If blasting is necessary to excavate such materials as shale, hardpan, soft sandstone, cemented gravel, or loose rock which normally can be classified as earth excavation, then this excavation shall be classified as rock excavation. Whenever a ledge of solid rock encountered with earth below it or where alternate layers of solid rock and earth occur, the earth shall be included in the allowance for rock when the thickness of the layer of earth is less than 12 inches, thus requiring it to be removed by blasting along with the ledges of rock. Blasting will be considered necessary when the soil and rock cannot be excavated at a rate of 50 cubic yards per hour by a competent operator with a back-hoe that has a minimum bucket curling force of 25,000 pounds (John Deere 690 or equivalent).

701.11.2 Whenever rock is encountered in the trench or elsewhere in any excavation required to be made, it shall be excavated to the line and grade as shown on the plans and within the limits described therein, unless otherwise authorized, in writing, by the ENGINEER.

701.11.3 For trenches, rock shall be excavated to a depth of 6 inches minimum below the outside bottom of the conduit except at points of rock and earth transitions at which points the rock shall be excavated to a minimum of 12 inches below the outside bottom of the conduit as shown on the detail sheets for trench cuts and backfill of rock. Any depression in the bottom of the trench caused by overshoot and/or excavating and being 6 inches or greater in depth from a theoretical bottom of trench grade shall be filled to the theoretical bottom of the trench with select soils. The trench shall be backfilled with select backfill material to a point 1 foot above the top of the conduit. The remainder of the trench shall be backfilled as specified herein. The complete trench backfill from the bottom through to the top of the subgrade shall meet the compaction and/or moisture requirements as specified herein.

701.11.4 BLASTING: Suitable weighted covering or mats shall be provided to confine all materials lifted by the blasting within the limits of the trench and to prevent injury of persons or damage to property. Blasting shall be under the supervision of a person qualified and experienced in the use and handling of explosives. All blasting operations shall be done in accordance with applicable local, state, and federal laws, ordinances, and codes regulating the transportation, storage, and use of explosives. Forty-eight hours prior to blasting operations, the CONTRACTOR shall notify the local law enforcement agency.

701.12 FOUNDATION

701.12.1 All pipe shall be bedded on a stable foundation in a trench which is completely free of water. The ENGINEER shall determine the adequacy of the foundation. Class V soils shall not be used as a foundation. If Class V soils are encountered at the bottom of the trench it shall be removed to the depth authorized by the ENGINEER and replaced with Class I, II or III soils.

701.12.2 Where an unstable foundation condition is encountered, it must be stabilized before laying pipe or alternative foundation methods utilized. The CONTRACTOR will be paid for foundation stabilization when required by the ENGINEER. Failure to notify the ENGINEER of an obvious unstable foundation condition prior to proceeding with placement of the pipe shall result in complete removal of the affected pipe, foundation stabilization, and replacement of the pipe at the CONTRACTOR'S expense.

701.12.3 Should the trench be inadvertently over-excavated below the foundation, the area of over-excavation shall be filled with select material in 6 inch lifts and compacted to a density of not less than 95 percent of maximum density, as determined by ASTM D 1557.

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701.12.4 Unless specifically approved in writing by the ENGINEER, the CONTRACTOR shall not proceed with pipe embedment in a trench where water is present or the foundation is saturated. Adequate dewatering, as specified in Section 701.7, shall be utilized.

701.13 PIPE EMBEDMENT

701.13.1 GENERAL:

701.13.1.1 The class of bedding used for each pipe shall be as shown on the plans or as specified in the Supplemental Technical Specifications.

701.13.1.2 The CONTRACTOR may request a change in the class of bedding required on a pipe, if authorized by the ENGINEER, all increase in the cost of labor and materials required to include upgrading of the pipe class will be at the CONTRACTOR'S expense with no additional cost to the OWNER.

701.13.2 RIGID PIPE EMBEDMENT:

701.13.2.1 The trenches shall be excavated in conformance with the trench width requirements in Section 701.10 and

701.13.2.2 Embedment material shall be Class I, II, III, or IV soils, or lean fill as specified in Section 207.

701.13.2.3 All soil in the embedment zone shall be placed in lifts not exceeding 8 inches in uncompacted depth, except that material along the side of the pipe shall not be placed above the spring line until the haunch area of the pipe is adequately filled and sliced such that no voids remain.

701.13.2.4 All soil shall be compacted to a density not less than 90 percent of maximum density, as determined by ASTM D 1557. The CONTRACTOR shall take care to assure that the pipe is not damaged or misaligned during compaction of the embedment.

701.13.3 FLEXIBLE PIPE EMBEDMENT:

701.13.3.1 Proper placement of soils in the embedment zone is extremely important in achieving a satisfactory installation of flexible pipe. The CONTRACTOR shall be aware that the soil classes have differing requirements relative to embedment. There are also differing requirements for embedment in dry and wet conditions (wet conditions meaning that the embedment zone will be subject to ground water).

701.13.3.2 Embedment material shall be Class I, II, or III soils, or lean fill as specified in Section 207.

701.13.3.3 Embedment soil shall be placed in lifts not exceeding 8 inches loose depth. The haunch shall be properly compacted by hand tampers utilizing due caution such that the pipe is not damaged or misaligned. Mechanical tampers shall not be utilized directly over the pipe in the embedment zone.

701.13.3.4 The CONTRACTOR may utilize acceptable on site soils in the embedment area which are in conformance with these specifications. The CONTRACTOR has the option of importing a different soil, however, additional compensation will only be allowed if the on site soils are Class IV or V.

701.13.3.5 Class I soil shall comply with the requirements of Section 302, AGGREGATE BASE COURSE.

701.13.3.6 Class II and III soils shall be compacted to a density of not less than 95 percent of maximum density in the embedment area, as determined by ASTM D 1557. The moisture content shall not exceed 5 percent above optimum.

701.14 FINAL BACKFILL

701.14.1 Final backfill shall consist of homogeneous soil except that boulders, frozen clumps, rubble, and Class V soils are excluded.

701.14.2 Final backfill shall be compacted to a density of not less than 90 percent of maximum density, as determined by ASTM D 1557 unless otherwise specified in the Contract Documents.

701.14.3 The upper portion of the final backfill may require specific soils and compaction in order to provide a suitable foundation for pavements, curb and gutter, sidewalk, or other type of structure.

701.15 COMPACTION METHODS

701.15.1 The CONTRACTOR shall be responsible for the compaction method utilized during foundation preparation, embedment placement, and final backfill except as otherwise specified herein or in the Supplemental Technical Specifications.

701.15.2 The use of mechanical vibratory compactors directly over the pipe is prohibited in the embedment area. Extreme care shall be taken when utilizing mechanical compactors in the haunch and initial backfill area in order to avoid damage to or misalignment of the pipe. The ENGINEER shall examine any damaged pipe and has the authority to direct that it be replaced with new pipe at no additional cost to the OWNER.

701.15.3 Flooding or jetting shall be allowed if the subsurface soils are compatible to its usage, as authorized by the ENGINEER. It shall not be used for compaction of flexible pipe, when the soil has a plastic limit of 7 or greater, and in areas of collapsible soils. The CONTRACTOR shall take any necessary precautions to minimize to negligible flotation of the pipe.

701.15.4 The CONTRACTOR shall, at the direction of the ENGINEER, excavate the compacted fill as necessary for the purpose of determining the adequacy of the compaction.

701.16 PAVEMENT

701.16.1 Either new street construction or pavement replacements shall satisfy the following design and construction requirements:

701.16.1.1 Unless permanent pavement is specified to be placed immediately, a temporary dust-free patch shall be placed wherever excavation is made through existing pavements, sidewalks, or driveways. The patch shall be placed, rolled, and maintained by the CONTRACTOR to provide a smooth surface for traffic until a permanent pavement is constructed within the time frame specified by the ENGINEER.

701.16.1.2 The subgrade preparation of the area to be paved shall be in accordance with Section 301 of these specifications. The asphalt pavement placed shall be in accordance with Section 336 and the concrete pavement shall be in accordance with Section 337. The placement of the other roadway items shall be in accordance with Section 340.

701.16.1.3 Material thickness for all pavement replacements within residential or arterial streets shall conform to the plans or the Standard Detail Drawings or match the existing pavement as authorized by the ENGINEER.

701.16.1.4 Pavement cuts of 8 ft. or more in width and 100 ft. or more in length shall be paved with a laydown machine.

701.16.1.5 When authorized by the ENGINEER, asphalt concrete base course may be used to replace surface course thickness requirements on streets that are scheduled for overlay.

701.16.1.6 The edges of all trenches at the base course level shall be neatly trimmed before beginning any paving replacement. All edges of the existing pavement adjacent to the trench cut shall be inspected. Undermined, broken, cracked, or unevenly cut portions shall be removed and the pavement edges retrimmed prior to pavement replacement. All vertical edges of the existing asphalt pavement adjacent to the trench cut and all surface areas for a width of at least 4 inches and no greater than 8 inches, shall be thoroughly cleaned and a tack coat applied prior to placing any hot mix asphalt. The finished surface of the pavement replacement shall be graded to conform to the existing contour both in cross section and profile.

701.16.1.7 Concrete pavement to replace cuts made in concrete paved streets, arterials, etc., shall conform to the Standard Detail Drawings for concrete pavement or in accordance with New Mexico Department of Transportation requirements where applicable.

701.16.1.8 When more than one-half of the surface area of a manhole, lamphole or valve box is found to extend into the area to receive a permanent asphaltic hot-mix surfacing and/or base pavement replacement, the existing pavement surrounding the manhole, lamphole, or valve box shall be removed to within those limits which will permit a permanent pavement replacement to be made in accordance with the approved plans.

701.16.1.9 Asphaltic hot mix shall not be placed upon the concrete collar, nor shall traffic be permitted upon the collar for at least 24 hours, or longer, if so directed by the ENGINEER. A tack coat of asphaltic emulsion may be applied after the concrete has taken its final set. During this time adequate barricading of the area shall be maintained by the CONTRACTOR.

701.16.1.10 If in the course of a pavement removal, a manhole, lamphole, and/or valve box is encountered and has a concrete collar about it and the collar is performing adequately, no special construction need be made in the permanent pavement replacement.

701.16.1.11 The CONTRACTOR shall make any small grade or alignment adjustment of the manhole, lamphole, and/or valve box encountered that is necessary to provide a smooth riding surface between the existing pavement and the patch and/or within the patch itself.

701.16.1.12 TESTING

701.16.1.12.1 A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM D2487, and the moisture density relationship determined in accordance either ASTM D698 or D1557, whichever is applicable.

701.16.1.12.2 A compaction test shall be taken for each 2 feet depth per 200 feet trench length or less, as directed by the ENGINEER. Compaction tests shall be taken in accordance with ASTM D2922 and D3017. Areas represented by non-complying tests shall be reworked and re-tested for compliance.

701.17 MEASUREMENT AND PAYMENT

701.17.1 TRENCHING, BACKFILLING, AND COMPACTION:

701.17.1.1 Trenching, backfilling, and compaction shall be combined into one unit and shall be measured and paid for as follows:

701.17.1.2 Measurement shall be made along the centerline of the pipe.

701.17.1.3 The unit of measurement shall be by the linear foot per pipe diameter per specified increment of depth.

701.17.1.4 The following depth increments will apply:

701.17.1.4.1 For water line installations the costs for trenching, backfilling and compaction shall be included in the unit price per linear foot of pipe per pipe diameter for maximum depth, such as: 4 to 14 inch diameter at 6 feet, 16 to 24 inch diameter pipe at 7 feet and all pipe larger than 24 inch at 8 feet. Separate payment will be specified in the Bid Proposal when required depths exceed the above depths.

701.17.1.4.2 For sewer installations the increments shall be 8 feet or less, 8 feet to 12 feet, 12 feet to 16 feet, 16 feet to 20 feet and thereafter at 4 foot intervals.

701.17.1.4.3 All depths shall be measured to the nearest foot.

701.17.1.5 All depths shall be measured from the invert of the pipe to the top of existing ground elevation. The existing ground elevation shall be the elevation of the surface that exists along the centerline of the pipe at the time of construction staking for said trenching.

701.17.1.5.1 Whenever a special pipe embedment detail is specified, on the plans, the trench depth shall be measured from the bottom of the embedment to the top of existing ground elevation. However, no additional trench depth shall be measured as a result of inadvertent over-excavation nor to accommodate trench dewatering.

701.17.1.6 Payment will be made at the unit price per linear foot per diameter of pipe per depth increment as specified in the Bid Proposal, and will include trenching, backfilling, and compaction for all trench zones. No additional payment will be made for compacted materials to bring trench backfill up to required depth.

701.17.2 OVER-EXCAVATION: Required over-excavation for foundation stabilization shall be measured by the cubic yard of material removed and replaced with compacted suitable material. Payment will be made at the unit price per cubic yard of compacted replacement material and shall include excavation, backfill material, and compaction.

701.17.3 ROCK EXCAVATION: Rock excavation will be measured by the cubic yard within the specified limits of the trench configuration. Blasting will be included in the rock excavation. Payment will be made at the unit price per cubic yard.

701.17.4 UNSUITABLE MATERIALS: Removal and disposal of unsuitable materials from the construction site shall be measured by the cubic yard of excavated material. Payment will be made at the unit price per cubic yard of excavated material.

701.17.5 PAVEMENT, SIDEWALK, AND DRIVEWAYS: Removal and disposal of existing pavement, sidewalks, and driveways will be measured by the square yard or square foot whichever is apropos. Payment will be made at the unit price per square yard or square foot as specified in the Bid Proposal.

701.17.6 SELECT MATERIALS: Where selected material is required in the backfilling operations, the quantity of material will be measured by the cubic yard of compacted material in place in the trench. Payment will be made at the unit price per cubic yard of select material as indicated above.

701.17.6.1 Whenever a special pipe embedment detail is specified, measurement and payment shall be as identified in the Bid Proposal.

701.17.7 DEWATERING: Dewatering operations for trench work shall be measured by the linear foot along the center-line of that portion of the trench which requires dewatering. Payment will be made at the unit price per linear foot of dewatered trench.

701.17.8 PAVEMENT:

701.17.8.1 Permanent or temporary pavement surfacing shall be measured and paid for in accordance with the paving section elements as defined under Section 300 for the specific item of work.

701.17.8.2 Permanent resurfacing or permanent surface patching will be measured on the basis of the square yard for new surfacing as provided in the applicable section of these specifications. For payment purposes, the normal maximum pavement cut width shall be as defined in the Table No. 701.17.8.2

TABLE No. 701.17.8.2

NORMAL MAXIMUM PAVEMENT CUT WIDTHS ALLOWED FOR PAYMENT PURPOSES

Soil Trench Pipe Max. Pavement

Stability Depth (TD) Size Cut Width

Stable. Soil Less than or equal ND less than or equal to 2 feet
stands in to 5 feet equal to 27"

a vert. cut

" Greater than 5' ND less than TD + 2 feet
or equal to 54"

" " ND greater than 1.6 X ND +
54" TD + 3'

Unstable. Soil does not stand in vert. cut
Any Any 2 X TD + OD

NOTES: 1. TD is trench depth; ND is nominal pipe diameter; and OD is outside pipe diameter.

2. Individual locations or conditions may warrant greater cut widths than those specified above. The ENGINEER shall authorize in writing the increase in the above pavement cut widths.

SECTION 801

INSTALLATION OF WATER TRANSMISSION, COLLECTOR AND DISTRIBUTION LINES

801.1 GENERAL

The water facilities and materials, specified herein, are associated with water transmission, collector and distribution lines.

801.2 REFERENCES

801.2.1 American Water Works Association
(Latest Edition) (AWWA):

C110 American National Standard for Ductile-Iron
and Gray-Iron Fittings, 3 in. through 48 in., for
Water and Other Liquids

C203 Coal-Tar Protective Coatings and Linings for
Steel Water Pipelines -Enamel and
Tape-Hot-Applied

C206 Field Welding of Steel Water Pipe

C207 Steel Pipe Flanges for Waterworks
Service-Sizes 4 in. through 144 in.

C502 Dry Barrel Fire Hydrants

C504 Rubber-Seated Butterfly Valves

C509 Resilient-Seated Gate Valves for Water and
Sewerage Systems

C600 Installation of Ductile-Iron Water Mains and
Their Appurtenances

C651 Disinfecting Water Mains

C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in.
Through 12 in., for Water Distribution

C905 Polyvinyl Chloride (PVC) Water Transmission
Pipe Nominal Diameter 14 in. through 36 in.

C909 Molecular Oriented Polyvinyl Chloride (PVCO),
Pressure Pipe 4" - 12" for water distribution.

M9 Concrete Pressure Pipe

M23 PVC Pipe-Design and Installation

801.2.2 This Publication:

SECTION 121 PLASTIC PIPE

SECTION 127 STEEL WATER PIPE

SECTION 128 CONCRETE CYLINDER PIPE

SECTION 129 DUCTILE IRON PIPE

SECTION 130 GRAY IRON AND DUCTILE IRON
FITTINGS

SECTION 340 PORTLAND CEMENT CONCRETE
CURBS, GUTTERS,
WALKS, DRIVEWAYS, ALLEY
INTERSECTIONS, SLOPE PAVING,
AND MEDIAN PAVING

SECTION 343 REMOVAL AND DISPOSAL OF
EXISTING PAVEMENT, CURBS,
GUTTERS, SIDEWALKS &
DRIVEPADS

SECTION 701 TRENCHING, EXCAVATION AND

BACKFILL

SECTION 1502 SUBMITTALS

801.3 MATERIALS:

801.3.1 GENERAL:

801.3.1.1 The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe manufactured in the United States of America will be acceptable.

801.3.1.2 Main line pipe and fittings shall be as specified in the Reference Section in this publication as listed above or as specified in the Supplemental Technical Specifications and/or as authorized by the ENGINEER.

801.3.2 PIPE:

801.3.2.2 Limitations of pipe materials versus pipe sizes will be as follows, unless otherwise specified on the plans or Supplemental Technical Specifications:

Pipe Type	Sizes
Ductile Iron	3" thru 64"
Concrete Cylinder(AWWA C303)	16" and larger
Plastic (PVC)	4" thru 20"
Welded Steel Pipe (AWWA 200)	16" and larger

801.3.2.3 The type of pipe used shall be approved by the ENGINEER. Steel pipe will be used only where specified on the drawings. All pipe shall be of domestic manufacture and origin. Unless otherwise approved by the ENGINEER, all pipe installed shall be identical from valve to valve.

801.3.3 GATE VALVES:

801.3.3.1 Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans or in the Supplemental Technical Specifications.

801.3.3.2 Resilient seat gate valve shall be used and shall conform to AWWA C 509. The gate valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall have a standard hub which opens counter-clockwise. Type valve ends shall be mechanical joints, unless otherwise specified on the plans. "O" ring retainer shall be

secured with nuts and bolts.

801.3.3.3 The resilient seat shall be mechanically retained or bonded on the valve gate (wedge disc).

801.3.3.4 All brass or bronze parts used on gate valves shall comply with AWWA C 509.

801.3.3.5 The outside of the valve body shall be painted with coal tar enamel or corrosion-resistant coating. The inside shall be protected with corrosion resistant coating, approved for potable water.

801.3.3.6 The valve stem shall comply with AWWA C 509. The material for the valve stem shall be brass or bronze, and shall have a minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi.

801.3.3.7 Gate valves shall have a 2 inch square operating hub nut. Gate valves in vaults with valve covers at ground level shall have a handwheel with the 2" nut welded to the center.

801.3.3.8 Maximum input torque to open and/or close the valve shall be 200 foot pounds for a 4-inch valve and 300 foot pounds for 6-inch under a working pressure of 200 psi.

801.3.3.9 No Project will be accepted by the OWNER until all valves are operational and accessible.

801.3.3.10 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card", as shown on Pages 801-5 and 801-6. The ENGINEER shall forward the card to OWNER.

801.3.4 RUBBER SEATED BUTTERFLY VALVES:

801.3.4.1 Butterfly valves will be used for sizes of 14 inches and larger, and shall comply to AWWA C 504.

801.3.4.2 Only short body, Class 150B valves are acceptable. Wafer type valves are not acceptable. Valve ends may be either mechanical joint or flanged.

801.3.4.3 The rubber seat shall be field replaceable on valve sizes 24 inches and larger. The rubber seat may be mechanically retained or bonded on the disc or valve body.

801.3.4.4 Butterfly valves shall have a 3 inch square operating hub nut. Butterfly valves in vaults with valve covers at ground level shall have a handwheel with the 3" nut welded to the center.

801.3.4.5 The valve shaft and disc shall be installed horizontally. The valve disc shall pivot and rotate on the horizontal axis.

801.3.4.6 The maximum input torque to open and/or close the valve shall not exceed 150 foot pounds under a minimum working pressure of 150 psi, and the butterfly operator shall be compatible with this pressure. Maximum operating torques shall be in accordance with AWWA C 504, Table 1, Class 150B. The manufacturer of the valve shall be responsible for the operator.

801.3.4.7 No project will be accepted by the OWNER until all valves are operational and accessible.

801.3.4.8 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card," as shown on pages 801-5 and 801-6. The ENGINEER shall forward the card to the OWNER.

801.3.5 VALVE BOXES: Valve boxes shall consist of Polyvinyl Chloride (PVC) C-900, or High Density Polyethylene Pipe, (HDPE), with corrugated exterior and smooth interior pipe cut to accommodate the required depth. No joints shall be allowed. Pipe diameter shall be 10 inches for valves in paved areas to accommodate the cover and lid specified here-in. The pipe shall be centered and placed true to vertical around the axis of the operating nut. Valve covers and lids for re-use water shall be different than those used for potable water, and shall be as shown on re-use project construction plans.

801.3.6 COMBINATION AIR AND VACUUM VALVES: Air and vacuum valves shall be the type and size shown on the plans.

801.3.7 FIRE HYDRANTS:

801.3.7.1 Fire hydrants and their extensions shall be in accordance with AWWA C 502, traffic type. Fire hydrants shall have one 5 1/4 inch diameter valve opening; 6 inch mechanical joint inlet connection; two 2 1/2 inch hose nozzle connections; and one 4 1/2 inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads. Fire hydrants shall have a bronze or cast iron, pentagon, operating nut, be designed for 150 psi. working pressure service, and have a normal bury of 4 to 4 1/2 feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.

801.3.7.2 The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the street's centerline or radially on a curvilinear installation. Fire hydrants shall have no more than 1/2 inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.

801.3.7.4 Hydrants shall be dry barrel, post-type with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring or bronze or cast iron bushing.

801.3.7.5 Exterior of hydrant, below the ground line, shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer and one coat "chrome yellow" enamel. The bonnet shall then be painted with a reflectorized paint using a color as close to "chrome-yellow" as possible.

801.3.7.6 The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6-inch mechanical joint connection and the inside shall be epoxy coated to prevent corrosion. The nozzle shall be threaded in place and retained by stainless steel locks. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.

801.3.7.7 Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.

801.3.7.8 To prevent loss of brass operating nuts due to theft or vandalism, the following shall be included in or on the fire hydrant:

801.3.7.8.1 Attach OWNER approved anti-theft device to the hydrant; or

801.3.7.8.2 The bonnet must be removed in order to remove the operating nut; or

801.3.7.8.3 Use a cast iron operating nut.

801.3.7.9 Fire hydrants shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.

801.3.7.10 Fire hydrants shall be properly restrained in accordance with Section 130. If mechanical restraint is used, each joint on the hydrant leg shall also be restrained.

801.3.8 PRESSURE REDUCING VALVE (PRV): Pressure reducing valve shall be a globe pattern, flanged end, pressure Class 125. Submittals for approval shall be made to the ENGINEER and approval must be received before installation. The following items are required in the PRV:

801.3.8.1 Materials:

801.3.8.1.1 Main valve-cast iron with brass trim.

801.3.8.2 Pilot Control System:

801.3.8.2.1 Adjustment from 15 psi to 75 psi.

801.3.8.2.2 Shut-off cock on all pilot control system lines.

801.3.8.2.3 Inlet flow strainer.

801.3.8.2.4 Closing speed control.

801.3.8.2.5 Opening speed control.

801.3.8.2.6 Flow stabilizer.

801.3.8.2.7 Tubing shall be copper.

801.3.8.3 Installation shall be as per the construction plans. ENGINEER shall determine final settings on PRV.

801.3.8.4 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a "Water Valve Data Card". The ENGINEER will forward the card to the OWNER.

801.3.9 TAPPING SLEEVES: (For other than Concrete Cylinder Pipe) For either taps greater than 2/3 line size, or size on size taps 12 inches or less, only approved, long body, fully gasketed tapping sleeves shall be allowed. During installation of the tapping sleeve, the pipe shall be fully supported to support the weight of the tapping sleeve and tapping machine.

801.3.9.1 Tapping sleeves of heavy welded steel bodies shall meet the following requirements:

801.3.9.1.1 Epoxy coated.

801.3.9.1.2 Bolts and nuts to be stainless steel.

801.3.9.1.3 Gaskets to be Buna-N rubber.

801.3.9.1.4 Flange to be flat face steel and comply with AWWA C-207.

801.3.9.1.5 Class D-ANSI 150 lbs. drilling.

801.3.9.1.6 Designed to sustain an operating pressure of 150 psi.

801.3.9.1.7 May be used on all water mains, 4" and larger.

801.3.9.2 Tapping sleeves of cast iron bodies shall meet the following requirements:

801.3.9.2.1 Mechanical joint type with a working pressure of 200 psi .

801.3.9.2.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.2.3 Sleeves to include side and end gaskets of Buna-N rubber.

801.3.9.2.4 Eight high strength steel bolts and nuts to secure the halves of the sleeve to the pipe.

801.3.9.2.5 May be used on all water mains, 4" and larger.

801.3.9.3 Tapping sleeves of short sleeve cast iron shall meet the following requirements:

801.3.9.3.1 Working pressure of 150 psi.

801.3.9.3.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.3.3 Outlet half to have an enclosed gasket in a groove for a pressure seal.

801.3.9.3.4 Four high strength steel bolts to secure halves of tapping sleeve to the pipe.

801.3.9.3.5 May be used on all water mains, 4" and larger.

801.4 WATER VALVE DATA CARD: Water Valve Data Card, as shown on pages 801-5 and 801-6 shall be prepared for all types of valves (Gate Valves, Butterfly Valves, Pressure Reducing Valves, Air Release Valves, etc.) according to the following instructions.

801.4.1 A Water Valve Data Card will be prepared for each valve installed.

801.4.2 The Valve Number will be assigned by the OWNER at a later date.

801.4.3 Valve Size is the nominal diameter of the valve, i.e., 6-inch, 14-inch or 48-inch. In the case of

compound valves give size of main valve and bypass valve, i.e., 24-inch and 4-inch, or 36-inch and 6-inch.

801.4.4 Valve Type is the general description of the valve, such as: Resilient-Seal Gate Valve, Butterfly Valve, Globe Valve, Check Valve, etc.

801.4.5 Make and Model refers to the manufacturer, make and model number to identify the valve for replacement parts. This information should be available from the shop drawings.

801.4.6 Number of Turns and Direction to Open is the number of revolutions of the operating nut to make the valve travel from fully closed to fully open, and the direction is either clockwise or counterclockwise, i.e., 54 turns counterclockwise. All standard valves shall open counterclockwise. Operation, turn count, and direction to open will be verified by the ENGINEER prior to installation.

801.4.7 Under Project Name is the assigned work order number.

801.4.8 Date Warranty Expires is the expiration date, under the contract, for requiring warranty repairs.

801.4.9 Street Location: Give both Block number and street name. For valves in intersections give both streets, i.e., 5200 San Mateo Blvd. NE and 3000 Candelaria NE.

801.4.10 The section on coordinate location shall be completed with information furnished by the ENGINEER.

801.4.11 All applicable items on the "Water Valve Data Card" should be filled in. However, accuracy is more unknown and cannot be determined, leave the space blank.

801.4.12 Depth to "Operator" is vertical distance from the top of actual valve operating nut to top of valve box cover.

801.5 FIRE HYDRANT DATA CARD
Fire Hydrant Data Card, as shown on page 801-8 shall be prepared for all installations of fire hydrants, according to the following instructions.

CARD NO. 801.4
WATER VALVE DATA CARD
(Front Side)

<u>MAP NO.</u>	<u>VALVE NO.</u>	<u>SIZE</u>	<u>TYPE</u> <input type="checkbox"/> -B.F.V. <input type="checkbox"/> -B.V. <input type="checkbox"/> -R.S.G.V.	<u>MAKE</u>	<u>MODEL</u>	<u>PROJECT</u>	<u>EMD</u> <input type="checkbox"/> -YES <input type="checkbox"/> -NO
		<u>TURNS</u>					

CHECKED																			
DATE																			
CREW																			

"CHECKED" CODE:

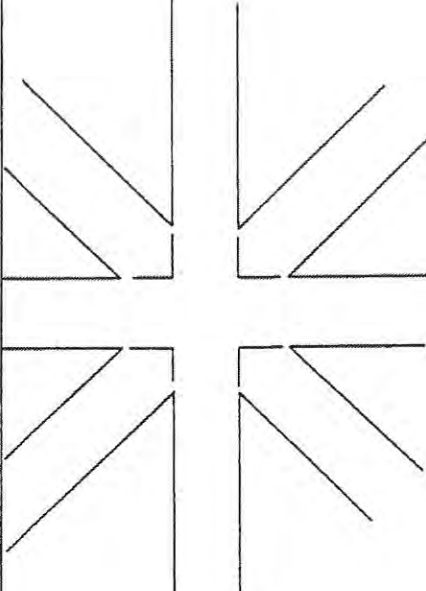







O - OK	L - LOST	E - EXTENSION NEEDED	C - NEEDS CLEANING
B - BROKEN	M - LID MISSING	R - RAISE TO GRADE	

WARRANTY EXPIRES _____	DEPTH TO OPER. _____
LOCATION _____	

CONTRACTOR _____	EXTENSION LENGTH _____
SKETCH EXACT LOCATION BELOW	

NOTES: 1. Available at Water Systems Division.
2. Size 4 inches x 8 inches.

CARD NO. 801.4
 WATER VALVE DATA CARD
 (Reverse Side)

	<p>REFERENCE SYMBOLS</p> <p>  - SUBJECT VALVE  - OTHER VALVE (S)  - PRESSURE REDUCING VALVE  - AIR RELIEF VALVE  - FIRE HYDRANT  - LINE VALVE IS FOR  - OTHER WATER LINES </p>
	<p>COORDINATES OF LID</p> <p> X - _____ Y - _____ Z - _____ </p>

INDICATE NORTH
 BY ARROW



801.5.1 Fire hydrant number will be assigned by the OWNER at a later date.

801.5.2 Fire hydrant type refers to the manufacturer's make and model.

801.5.3 Location. Indicate both block number and street name. At intersections indicate both street names.

801.5.4 Date installed. Indicate actual date the hydrant was installed.

801.5.5 Depth. Indicate the actual depth in feet of the lower barrel of the fire hydrant. This depth is measured from the shoe to the break-away flanges of the hydrant.

801.5.6 On the reverse side of the card indicate the location of fire hydrant on the sketch.

801.6 WATER LINE CONNECTIONS

801.6.1 GENERAL : All new water line tie-ins to the existing water system shall be directly inspected and approved by the ENGINEER. This includes non-pressurized or pressurized connections that will result in extension of the existing system.

801.7 LOCATIONS OF WATER MAINS AND SEWER LINES

801.7.1 Unless otherwise authorized by the ENGINEER, parallel water and sewer lines shall be installed at least 10 feet apart horizontally, and the water line shall be at a higher elevation than the sewer. Separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 18 inches above the sewer; when water and sewer lines cross each other, the water line shall be at least 18 inches above the sewer; otherwise the sewer shall be of pressure class pipe extending between manholes, or concrete encased for 10 feet on each side of the water line as shown in the Standard Detail Drawings. The crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

801.7.2 Water mains shall not be constructed under walkways, sidewalks, curbs and gutters, driveways, or similar concrete structures by tunneling underneath them. Trenchless technologies may be allowed with prior approval by the OWNER. The CONTRACTOR will cut these structures by using a concrete saw or, at his option, he may remove and replace the section of the concrete

structure to the nearest full expansion joint or edge.

801.8 TRENCHING AND BACKFILLING

801.8.1 All trenching and backfilling shall be in full accordance with Section 701. The minimum cover over distribution lines shall be 3 feet, and 4 feet of cover over transmission and collector lines.

801.9 GENERAL INSTALLATION ITEMS

801.9.1 Trenching, bedding, and backfilling shall comply with the requirements set forth in Section 701.

801.9.2 Pipe and accessories shall be new and unused and shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. No other pipe or material of any kind shall be placed inside of a pipe or fitting after the coating has been applied.

801.9.3 The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during operations by plugging or other approved methods. When work is not in progress, open ends of pipes and fittings shall be securely closed so that no other substances will enter the pipes or fittings. Any section of the pipe found to be defective before or after laying shall be replaced with sound pipe without additional expense to the OWNER.

801.9.4 All nuts and bolts utilized in underground pipe connections shall be stainless steel, high strength cast iron or high grade, high strength steel. The full length of each section of pipe shall rest solidly upon the bed, with recesses excavated to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipes shall not be laid in water or when trench or weather conditions are unsuitable for the work except by as authorized by the ENGINEER. All unconnected ends of pipes shall have a valve, plug, or cap installed on it.

801.9.5 Pipe shall be laid to line and/or grade shown on the plans or as staked in the field. Changes in horizontal or vertical alignment of the pipe at a joint shall not exceed the manufacturer's recommended deflection for the type and size pipe being laid. When the change required is more than the recommended deflection, a fitting or several short joints of pipe shall be used. PVC pipe may not be deflected at the joints.

CARD NO. 801.5
FIRE HYDRANT DATA CARD

FIRE HYDRANT NUMBER														
INSP.														
REP.														
CREW														
DATE														

TYPE	LOCATION
DATE INSTALLED	VALVES TO CLOSE FOR REPAIRS
DEPTH	REMARKS

FRONT SIDE

REVERSE SIDE

801.9.6 When new pipe is to be connected to an existing pipe or when crossing an existing pipe line, the CONTRACTOR shall excavate the existing lines well in advance of the laying of the new pipe line to enable the ENGINEER to verify their elevation and placement and to make any changes in grade and/or alignment of the new pipe line that may be required.

801.9.7 On all push-on-joints (bell and spigot, fluid-tite, and ring-tite) the rubber gasket shall be removed, cleaned, the groove cleaned, the gasket replaced, and the bell or plain end cleaned before jointing. The gasket and the bell or plain end of the pipe to be jointed shall both be lubricated with a suitable soft vegetable soap compound to facilitate jointing. Care shall be taken to insure that neither the bell or collar, or the pipe being jointed is damaged as it is being pushed home.

801.9.8 Flanged and mechanical joints shall be made with machine bolts and nuts of the proper size only. All components of these types of joints shall be cleaned before jointing. Only one (1) gasket will be permitted in a flange joint. In a mechanical joint the plain end pipe shall be fully seated before the gasket and gland is slipped up to the bell. Nuts on both types of joints shall be tightened by alternating nuts 180 degrees apart. The CONTRACTOR shall be responsible for assuring that proper torque is achieved and shall have a torque wrench available for verification by the ENGINEER.

801.9.9 When laying PVC pipe, a metalized detectable warning tape shall be installed a minimum of 1 foot above the top of pipe and 3 to 6 feet below the final surface. The tape shall be detectable with a standard metal pipe locator. The color of tape shall be safety precaution blue and will be inscribed at 10-foot intervals with the words, "CAUTION BURIED WATER LINE BELOW." Tape shall be 2 inches wide. The tape shall be constructed of material that is impervious to alkalis, acids, chemical reagents, and solvents found in the soils.

801.9.10 When laying pipe, Electronic Marker Disks (EMDs) shall be installed in accordance with Section 170.

801.10 SPECIFIC PIPE LAYING REQUIREMENTS

801.10.1 Ductile iron pipe shall be installed in accordance with AWWA C 600 and as herein specified.

801.10.2 Steel pipe shall be installed in accordance with AWWA C 206 for welded joint and as herein specified. All field welded joints shall have one coat of coal-tar enamel of 3/32 inch thickness.

801.10.3 Plastic pressure pipe shall be installed in accordance with AWWA M 23 and C 900 and/or manufacturer's printed recommendations, whichever is applicable. Where a conflict arises with this Specification, this Specification shall control. Trenching, embedment and backfill shall be specified in Section 701. A reference mark (a distinct circumferential line) is placed on the pipes spigot by the manufacturer to indicate the correct depth of the spigot penetration into the pipes gasket joint. If the pipe is seated too deep or too shallow, the pipe may buckle or separate due to thermal expansion/contraction, therefore particular attention must be exercised when jointing pipe. The reference mark must be showing and not farther than 1/2" from the leading edge of the bell. The CONTRACTOR shall verify that the manufacturer's reference mark is correct per manufacturer's literature.

801.10.4 All welded steel and concrete cylinder pipe shall have two small bond wires of low resistance, or other approved method, welded across the joint to make the joint electrically continuous. Where rigid joints are specified they shall be provided as specified herein. The outside joint recess shall be completely filled with a rich low shrinkage cement grout. The concrete surface in contact with the joint mortar shall be moistened with water just prior to pouring the joint recess. The mortar shall be poured into the joint recess against a waterproof paper or cloth diaper laid around and lapping the outside field joint. The diaper shall completely and snugly enclose the joint recess, being held in place by metal box strapping or wire. The mortar shall be poured into an opening slightly to one side on the top of the pipe and rodded by a flexible wire rod into place until it appears on the opposite side completely. After the joint recess has been filled with mortar, adjoining pipe sections shall not be disturbed. After the joint has been made, the concrete lining surfaces of the joint shall be moistened and the interior recess tightly jointed and troweled flush and smooth with the inside pipe surface. Grout for painting the interior joints shall be of a stiff consistency and shall have low shrinkage characteristics. In sizes of pipe smaller than 24", the mortar shall be buttered all around the shoulder inside the bell before the spigot is entered. A backing-up tool, such as an inflated rubber ball wrapped with burlap, shall be pulled through the joint to compact the mortar, completely fill the inside annular space and wipe off the excess mortar. Each joint will be inspected by the ENGINEER for proper and complete closure prior to final acceptance. Flanges shall be protected by "cocoon" type protection coating of coal-tar and felt in accordance with AWWA C 203. When moving individual pipe sections, the pipe shall be lifted using two web or belt type slings which support the pipe between the third and outside quarter points.

801.10.5 All fittings and valves shall be installed as per the type of joint as stated herein and/or as shown on the plans.

801.10.6 All couplings, clamps, sleeves, etc shall be installed as per the manufacturer's printed recommendations and as approved by the ENGINEER. The CONTRACTOR shall properly restrain all appurtenances as necessary.

801.10.7 All waterlines installed as part of a re-use system or other non-potable use shall be purple in color or shall be encased in purple PVC wrap.

801.11 CUTTING: The cutting of any type of pipe shall be done as per the manufacturer's printed recommendations, as approved by the ENGINEER. Care shall be taken in cutting any pipe that has an internal and/or external lining or coating.

801.12 BLOCKING AND RESTRAINED JOINTS

801.12.1 All restrained joints shall be by mechanical means unless directed or approved otherwise by the ENGINEER.

801.12.2 All tees, bends shall be restrained by mechanical means. Valves in runs need not be restrained, except that butterfly valves shall be flanged. Where rigid joints are called for on concrete cylinder pipe, the joints shall be flanged or field welded bell and spigot joints in accordance with the manufacturer's recommendation.

801.12.3 All caps and plugs on dead end lines will be mechanically restrained when feasible. Blocking may also be required when adequate restrain length is not available.

801.12.4 Where restrained joints on ductile iron pipe, or PVC pipe are called for on the plan, the mechanical restraining system employed shall conform to the recommendations of the pipe manufacturer. The restrained joint will be subject to the hydrostatic test specified herein.

801.13 RESTRAINING JOINTS FOR WELDED STEEL AND CONCRETE CYLINDER PIPE

801.13.1 Restrained joints in welded steel and concrete cylinder pipe for thrust restraint shall be produced by continuous welding the pipe joints and as shown on the plans.

801.13.2 Unless otherwise stated in the supplemental specifications the working pressure (operating plus transient) shall be 150 psi. The value for weight of overburden and the coefficient of friction

shall be stated in the supplemental specifications.

801.14 TAPS INTO EXISTING CONCRETE CYLINDER PIPE

801.14.1 OBJECTIVE: The intent of this Subsection is to establish procedural and design criteria for making taps into existing concrete cylinder pipe for water distribution line extensions, and will be applicable to 4-inch and larger size water taps.

801.14.2 NEW WATER LINES: No non-factory taps will be allowed on newly-installed concrete cylinder pipes.

801.14.3 EXISTING WATER LINES:

801.14.3.1 Taps to existing concrete cylinder pipe must be approved in writing by the OWNER. The requester shall provide the following information:

801.14.3.1.1 Justification for the tap,

801.14.3.1.2 Project name and number, if applicable,

801.14.3.1.3 Date tap required,

801.14.3.1.4 Name of the CONTRACTOR who will be making the tap.

801.14.3.2 The CONTRACTOR shall coordinate the work with the OWNER before commencing work. The OWNER shall inspect and approve the entire installation of the tap.

801.14.4 INSTALLATION OF FIELD TAP:

801.14.4.1 Installation of field taps on concrete cylinder pipe shall be no smaller than 4 in. and no larger than 2/3 diameter of pipe to be tapped. No "weld neck" or weld on outlets will be used.

801.14.4.2 For field taps larger than 2/3 of pipe diameter, a tee will be inserted into the line.

801.14.4.3 For field taps greater than 4 in. and less than 2/3 diameter of pipe to be tapped an approved tapping saddle will be used. Tapping saddles shall be approved by the ENGINEER

801.15 SALVAGED MATERIALS

All salvaged materials (pipe, fittings, valves and other water line appurtenances) shall be stockpiled on-site in a neat manner by the CONTRACTOR. The ENGINEER and a representative of OWNER will inspect the stockpiled materials for salvage fitness and direct the following disposition:

801.15.1 If the material is considered salvageable, the CONTRACTOR will be directed to deliver the material to the OWNER. The CONTRACTOR will be responsible for the loading, transportation and off-loading of the salvageable materials. When the materials are delivered, the CONTRACTOR shall obtain a signed receipt from the OWNER. Before final acceptance of the project, all signed receipts will be submitted to the ENGINEER for accounting purposes.

801.15.2 Materials that do not have salvageable value will be disposed of by the CONTRACTOR at no additional cost to the OWNER.

801.16 HYDROSTATIC TESTS:

801.16.1 The CONTRACTOR shall be required to perform hydrostatic tests in all water mains, laterals, dead ends, and service lines in accordance with AWWA C 600. The test shall be conducted in the presence of the ENGINEER or his authorized representative. The testing of the lines shall be done without being connected to existing lines unless approved by the ENGINEER. The CONTRACTOR shall provide all temporary plugs required. If connections to the existing lines are allowed by the ENGINEER, it is with the understanding that the CONTRACTOR assumes any and all responsibility in case of damage or failure of the existing system. Water used for disinfecting may be used for hydrostatic testing. Leakage through connections to the existing system, leaks in the existing lines, or leaking existing valves under the test pressure will invalidate the test. The lines shall be tested at 150 pounds, or 1.5 times the normal working pressure of the line, whichever is greater, for not less than two hours. All taps, gauges and necessary equipment shall be provided by the CONTRACTOR as approved by the ENGINEER, however, the ENGINEER may utilize gauges provided by himself if he so elects. Each section of the new line, between valves shall be tested to demonstrate that each valve will hold the test pressure. No installed pipe will be accepted if the leakage is greater than that determined by hydrostatic test sheet calculations in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the test pressure in pounds per square inch gauge. During the test the test pressure should not lose more than 10 psig without being pumped back up to test pressure. The totals of the gallons of water required to hold the test pressure during the two hours and the amount of water required to return the line to the test pressure at the end of the test period is the total leakage. If the total leakage is less than the allowable, the line can be accepted. All visible leaks will be repaired regardless of the amount of leakage.

801.16.2 CONTRACTOR shall submit a testing plan to the ENGINEER for approval. In cases where a new main is being connected to an existing main without the installation of a new valve, the end of the new main shall be temporarily capped and blocked and a hydro-static test performed. Hydro-static tests should not be made such that an existing valve or existing main is included in the test section. Test Sheet on page 801-12 is the standard form which must be completed at the time of the test, signed by the ENGINEER and delivered to the OWNER prior to acceptance of the Project

801.17 DISINFECTING, FLUSHING, AND BACTERIA TESTING OF WATER LINES: New water lines shall be installed in such a manner as to not require cleaning by flushing. This shall require capping of stockpiled line, capping of lines at night and any other time work is not in progress, visual inspection of interior of lines, and cleaning as necessary, prior to placing in the trench. Every effort shall be made to prevent the entry of dirt and debris into pipelines under construction.

801.17.1 Mains shall be disinfected in accordance with AWWA C 651 or as required below with chlorine liquid solution, which is added by an approved method at one end of the lines as water is drawn through the lines and service connections. The chlorine solution shall remain in the line for at least 24 hours. The lines shall then be flushed until the chlorine residual is equal to the normal residual in the existing system or at 0.5 parts per million for unchlorinated water. Dry chlorine will not be used for disinfection of water lines. The flushed water will be disposed of by the CONTRACTOR appropriately.

801.17.2. Prior to the line being placed into service, bacteria samples shall be taken by the OWNER. Should results of the bacteriological analysis be unsatisfactory, the disinfection procedure shall be repeated.

801.17.3 The CONTRACTOR will be granted two free volumes of water for testing, disinfecting and flushing the new installation. All water used for testing, disinfecting and flushing shall be metered. If additional water is needed for these purposes, the water will be paid for by the CONTRACTOR at the current water rates. An approved backflow preventor system shall be used when withdrawing water from any waterlines and hydrants. Direct connection to the water system shall not be used for providing water for disinfecting, testing or flushing.

801.17.4 OWNER or the ENGINEER will collect the water sample to test the water in the existing lines at

TEST SHEET 801.16.2
HYDROSTATIC TEST

Test No.: _____

PROJECT NAME: _____

DATE: _____

PROJECT
CONTRACTOR: _____

NUMBER: _____

LOCATION: _____

PIPE MATERIAL: _____ DIP _____ PVC _____ CCP _____ Fabricated Steel

Test: Length (S) = _____ ft.

Size (D) = _____ inches

Pressure (P) = _____ psi - gauge (average test pressure during the hydrostatic test)

Leakage Allowed (L_{ALL}) - _____ gal / hr ($L_{ALL} = SD \ P / 133,200$ per AWWA C600-99)

Basis: Only resilient seated gate valves and/or rubber seated butterfly valves are used. No metal seated valves are allowed.

Total Leakage Allowed for 2 hour Test Period: $L_{ALL} \times 2 \text{ hours} =$ _____ gallons

Actual Amount of Water ADDED to maintain 150 psi \pm 5 psi for 2 hours = _____ gallons

If actual amount of water added is LESS THAN total leakage allowed, test PASSED

If actual amount of water added is GREATER THAN total leakage allowed, test FAILED

_____ Test Passed

_____ Test Failed

Contractor _____ Date _____

Inspector _____ Date _____

Project Manager _____ Date _____

COMMENTS:

Note: See Section 801.16 for the Specification for test procedure. A0224B/D2376B
the point of delivery for assurance of clean and

potable water. The water in the existing lines will be used for testing and flushing.

801.18 INTERFERENCE WITH SERVICE AND SCHEDULE OR WORK

801.18.1 The CONTRACTOR shall obtain the permission of the ENGINEER before making any connections with existing mains. The required operation of existing valves will be performed by the OWNER as per Section 18.

801.18.2 Work shall be started after authorization of the ENGINEER and shall be completed in a prompt efficient manner in coordination and cooperation with other utilities concerned. 801.18.3 The CONTRACTOR will be required to arrange his construction program with a view of maintaining continuous service to water users, from existing facilities, to the fullest extent possible. He shall, at all times, withhold construction work, where any conflict in the service requirements occur.

801.19 NOTIFICATION OF COMPLETION

The CONTRACTOR shall notify the ENGINEER, in writing, when the CONTRACTOR has completed construction of a water line. This notification should be submitted immediately upon completion; the water line will not be placed in service by the OWNER before the sewer service and the street are in place and until the OWNER has received and accepted all adequate documentation submittals. OWNER shall consider, on a case by case basis, exceptions for fire protection purposes.

801.20 VALVE CAN REHABILITATION

801.20.1 The rehabilitation of existing valve cans as shown on the plans or as authorized by the ENGINEER shall include the following:

801.20.1.1 Removing the existing valve can and ring and cover and installing the new type can and cover.

801.20.1.2 Install a new concrete collar in paved and unpaved areas. Size and direction of the line should be noted on the collar.

801.20.1.3 The existing ring and cover shall be considered salvaged materials.

801.20.1.4 Removal and replacement of the pavement.

801.20.1.5 Excavation, backfill, and compaction.

801.20.1.6 All materials, labor, and equipment

necessary to do the work.

801.20.2 The work under this item shall be constructed per the Standard Detail Drawings.

801.21 DOCUMENTATION SUBMITTALS

801.21.1 At the time of the final inspection the following documentation will be submitted to the ENGINEER and OWNER:

801.21.1.1 Hydrostatic test data of the new water line system.

801.21.1.2 Microbiological test reports which were taken at representative locations along the system.

801.21.1.3 Fire hydrant and valve cards. All valves at that time shall be in the open position, unless otherwise authorized by the ENGINEER and OWNER.

801.21.1.4 A marked-up set of construction drawings reflecting as-built conditions. This does not supplant the requirements for record or as-built drawings.

801.22 MEASUREMENT AND PAYMENT

801.22.1 PIPE: Payment for all sizes and types of pipe shall be made on the basis of measurement per linear foot, including the length of fittings, valves, etc. The contract unit price of pipe shall include all jointing and coupling materials necessary for its installation and connections to other sections of pipe, except for fittings, valves or other appurtenances. The cost of hydrostatic testing, flushing and disinfecting of new water lines shall be included in the contract unit price for the item in place. Pipe locator tape for pipe shall be included in the contract unit price of the pipe.

801.22.2 DEPTH OF TRENCH:

801.22.2.1 The contract unit price for pipe and appurtenances in all cases shall include the trenching, installation, and compacted backfilling for trench cuts as specified in Section 701.

801.22.2.2 Payment for additional depth, below the specified limits shall be made on the contract unit price per vertical foot per linear foot, and shall include trenching, installation of pipe and appurtenances, and compacted backfilling in the deeper trench.

801.22.3 REMOVAL AND RELAY, RETURN, OR DISPOSAL OF PIPE:

801.22.3.1 The contract unit price for removal and relaying pipe shall include all labor and new gasket material necessary to remove and reinstall pipe in another location.

801.22.3.2 The payment for removing and the delivery 2-1/4 inch to 14 inch pipe to the Water Utility Division in the City Yard as salvage materials shall be made on the unit price per linear foot. Only cast iron or ductile iron pipe that is undamaged will be considered for salvage.

801.22.3.3 Where there is no salvage value of the pipe, the pipe shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on a unit price per linear foot; there will be no additional cost to the OWNER for disposal.

801.22.3.4 The payments for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.4 CAST IRON AND DUCTILE IRON FITTINGS:

801.22.4.1 All cast iron and ductile iron fittings shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint ends fitting for the type and size of fitting used as specified in AWWA C 110, regardless of the type of ends on the fitting installed. The contract unit price per pound of fittings shall include all gaskets, glands, bolts and nuts required, no separate payment will be made for these items.

801.22.4.2 When the CONTRACTOR installs a OWNER-furnished fitting and replaces that fitting in the OWNER's inventory, the CONTRACTOR shall be paid the full contract unit price of that fitting as outlined above. If the CONTRACTOR does not replace the fitting in the OWNER's inventory the payment to the CONTRACTOR will be at the contract unit price of the fitting less the cost of the fitting itself.

801.22.4.3 Fitting insertion: The insertion of a fitting into an existing pipe line shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint end fitting and if required an all mechanical joint connecting piece (coupling) of the type fitting and size used, as specified in AWWA C 110, regardless of the type of ends on the fitting and coupling installed. This payment shall include all compensation for the excavation, cutting and removal of the existing pipe, installation of the fitting and coupling, if required, the recutting of the existing pipe or new pipe installed between the fitting and coupling, and backfill and compaction complete in place. In addition to the

payment for the fitting insertion, the CONTRACTOR shall be paid for one each non-pressurized (wet) connection and if pavement, curb and gutter, sidewalk, driveway, etc., are removed, these items will be paid for as part of the appropriate item.

801.22.5 REMOVAL AND RELAY, RETURN OR DISPOSAL OF PIPE APPURTENANCES:

801.22.5.1 The contract unit price for removal and relaying the appurtenances shall include all labor and new gasket material necessary to remove and reinstall the item in another location.

801.22.5.2 The payment for removing and returning 2 1/4 inch to 36 inch appurtenance to the OWNER as salvaged material shall be made on the contract unit price per each or unit price per pound. Only undamaged material will be considered for salvage.

801.22.5.3 Where there is no salvage value of the appurtenance, the item shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on the contract unit price per each or contract unit price per pound; there will be no additional cost to the OWNER for disposal.

801.22.5.4 The payment for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.5.5 Only cast iron or ductile iron appurtenances will be removed and relaid or removed and returned for salvage.

801.22.5.6 Fire hydrant relocation payment shall be the contract unit price per each for removal and reinstallation and shall include excavation, blocking, aggregate and compacted backfilling, as shown in the Standard Detail Drawings.

801.22.6 CONCRETE CYLINDER OR WELDED STEEL PIPE FITTINGS:

Concrete cylinder or welded steel pipe fittings, such as flanged outlets, bends, reducers, etc., shall be considered as incidental to the contract unit price for installation of the pipe, as shown on the construction plans.

801.22.7 COUPLINGS: The measurement for steel or cast iron couplings shall include payment for all gaskets, bolts, and incidental materials as may be needed for its complete installation. Payment shall be made on the contract unit price per each size of coupling required.

801.22.8 STEEL FITTINGS: Steel fittings shall only be used when authorized by the ENGINEER and

when needed to connect to an existing steel water line. Measurement and payment for steel fittings, when authorized, shall be made at the contract unit price per pound based on weights of an all mechanical joint ends fitting of the type fitting and size used, as specified in AWWA C 110. This payment shall include all fabrication and welding required on the fitting.

801.22.9 VALVE AND VALVE CANS:

801.22.9.1 Valves shall be measured and paid for at the contract unit price per each size of valve. The contract unit price for valves 24-inch and larger shall include the bypass valve, fittings and piping, complete in place.

801.22.9.2 Valve boxes shall be measured and paid for at the contract unit price per each per type of valve boxes, which payment shall include the concrete pad with stem extension when required, complete in place.

801.22.10 FIRE HYDRANTS: Fire hydrants shall be measured and paid for at the contract unit price per each per depth of bury, which payment shall include excavation, gravel drain pocket, mechanical restraining system or blocking, backfilling, and compaction complete in place.

801.22.11 VALVE BOX ADJUSTMENTS:

801.22.11.1 Valve box adjustment using the adjustment collar and insert shall be measured and paid for per each complete in place including the concrete pad.

801.22.11.2 When the adjustment height required on a valve box exceeds the height of the adjustment collar or the valve box has been previously adjusted, the valve box will have to be rehabilitated. Measurement and payment shall be made as specified under Valve Box Rehabilitation.

801.22.12 WATER LINE CONNECTIONS:

801.22.12.1 Nonpressurized Connections: Nonpressurized connections shall be measured and paid for at the contract unit price per each for any size or type of pipe, complete in place, which shall include any extra excavation required, shut-off coordination, the removal of any caps or plugs or the cutting of the existing pipe any number of times required to make the connection, drainage plan (if required), pumping or handling of the water, backfilling and compaction. Fittings shall be measured and paid for per pound as specified herein, including all types of couplings.

801.22.12.2 Pressurized Connection: Pressurized connections shall be measured and paid for at the contract unit price per each per location shown on the plans, complete in place, which shall include excavation, the cleaning or removal of existing pipe coatings and coverings, air testing, the tapping, any grouting required, backfilling and compaction. The installation of the tapping sleeve and gate valve is to be paid under separate item or as indicated on the plans.

801.22.12.3 Connection to Steel Water Lines: All connections to existing steel water lines shall be made by using a transition coupling. The measurement and payment for this type of connection shall be made per pound of fitting for a Mechanical-Joint Connecting Piece of the size used based on the weights specified in AWWA C 110.

801.22.13 THRUST RESTRAINTS:

801.22.13.1 CONCRETE BLOCKING: When concrete blocking is used as a substitute for a mechanically restrained joint as authorized by the ENGINEER, the blocking shall be measured and paid for at the contract unit price per cubic yard placed to the neat lines shown on the plans or per the Standard Detail Drawings.

801.22.13.2 RESTRAINING JOINTS FOR WELDED STEEL OR CONCRETE CYLINDER PIPE: Measurement and payment for this item shall be at the contract unit price per linear inch of circumferential weld, complete in place, including protective coating of the weld.

801.22.13.3 MECHANICALLY RESTRAINED JOINTS: Mechanically restrained joint assemblies shall be measured and paid for at the contract unit price per each assembly per size of the pipe per each type (pipe to pipe, pipe to mechanical joint, pipe to fitting, etc.) complete in place.

801.22.13.4 VALVE ANCHORAGE: No separate measurement nor payment shall be made for valve anchorage as per Standard Detail Drawing. The cost of this work shall be included with the cost of the valve.

801.22.14 PRESSURE REDUCING VALVE (PRV): Measurement and payment for furnishing and installing a PRV shall be made at the contract unit price per each per size, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and material required for the excavation, the PRV, all bypass piping, fittings and valves both inside and outside the structure, the structure, backfilling and compaction.

801.22.15 AIR RELEASE VALVE (ARV): Measurement and payment for furnishing and installing an ARV shall be made at the contract unit price per each per size of ARV, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and materials required for the excavation, ARV, piping, fittings, gate valve, can or structure, backfilling, and compaction.

801.22.16 VALVE BOX REHABILITATION: Valve box rehabilitation shall be measured and paid for at the contract unit price per each, complete in place which shall include the removal of the existing valve box, excavation, the new valve box installed, backfilling, compaction and the installation of the concrete collar.

801.22.17 CONCRETE STRUCTURES: The removal and replacement of concrete structures such as sidewalks, drive pads, and curb and gutters etc., required for the installation of water lines shall be measured and paid for as specified in Section 340 and 343.

801.22.18 BEDDING MATERIAL: No separate measurement nor payment shall be made for bedding material required when shown on the plans or when required due to the type of pipe supplied by the CONTRACTOR. The cost of the bedding material shall be included in the unit price of the pipe. If bedding material is not required by the conditions above but is required due to the conditions encountered during construction then the bedding material shall be measured and paid for as specified in Section 701.

801.22.19 SURPLUS MATERIALS: No separate measure nor payment will be made for the removal and disposal of surplus material generated by the pipe, bedding material or the use of lean fill.

SECTION 901

SANITARY SEWER COLLECTOR AND INTERCEPTOR FACILITIES

901.1 GENERAL

The construction items, specified in this section, are common to sanitary sewer collector and interceptor facilities.

901.2 REFERENCES

901.2.1 ASTM

C 43	D 2321
C 425	D 3034
C 443	F 679
C 478	F 794

901.2.2 AWWA

C 603

901.2.3 This publication per SECTIONS:

101	123
102	124
105	125
106	129
108	701
121	

901.3 MATERIALS

901.3.1 PIPE: Sewer line pipe and fittings shall be as specified in other sections, as follows:

Plastic Pipe	Section 121
Reinforced Concrete Pipe	Section 123
Reinforced Concrete Pressure Pipe	Section 124
Vitrified Clay Pipe	Section 125
Ductile Iron Pipe	Section 129

901.4 CERTIFICATION

The OWNER/ENGINEER will be supplied with a certification on each item or type of material required in the sewer line, as to that item meeting the specifications and/or the reference specifications before that item is installed.

901.5 INSTALLATION

901.5.1 GENERAL:

901.5.1.1 Pipe and appurtenances shall be new and unused. The type of pipe to be installed shall be as approved by these specifications or unless otherwise shown on the drawings. Pipe and appurtenances

shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken to prevent damage to any pipe coating.

901.5.1.2 The interior of the pipe shall be thoroughly cleaned of foreign material before being lowered into the trench and shall be kept clean during construction operations. When work is not in progress, the open ends of pipe shall be securely closed so that no foreign materials will enter the pipe. Any section of pipe found to be defective before or after laying shall be replaced with sound pipe, or repaired in a manner satisfactory to the ENGINEER, without additional expense to the OWNER.

901.5.1.3 The CONTRACTOR shall install a plug in the new sewer at any point of connection to an existing system. The plug shall remain in place until the ENGINEER authorizes its removal in writing. The CONTRACTOR shall not flush or otherwise discharge any flow into an existing system unless approved in writing by the ENGINEER.

901.5.1.4 Pipe shall be laid to line and grade as shown on the plans and as staked in the field. The bedding of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. Suitable excavation shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustment to the line and grade shall be made by scraping away or filling in with pipe zone material under the body of the pipe, and not by wedging or blocking. When connections are to be made to any existing manhole, pipe, or other improvement, the actual elevation or position of which cannot be determined without excavation, the CONTRACTOR shall excavate for and expose the existing improvement before laying the connecting pipe or conduit. When existing underground improvements may reasonably be expected to conflict with the line or grade established for the new sewer line, the ENGINEER shall request the CONTRACTOR to excavate as necessary to expose and locate such potentially conflicting underground improvements prior to laying the new pipe. Any adjustment in line or grade which may be necessary to accomplish the intent of the plans will be made, and the CONTRACTOR will be paid for any additional work resulting from such change in line or grade in the manner provided for in the General Conditions.

901.5.1.5 Connections to existing manholes shall be made by core drilling through the manhole wall. The CONTRACTOR shall take care to avoid unnecessary damage to the existing manhole.

901.5.1.6 Pipe shall be laid upgrade in a continuous operation from structure to structure, with the socket or collar ends of the pipe upgrade unless otherwise permitted by the ENGINEER.

901.5.1.7 Sanitary sewer mains shall not be constructed under walkways, sidewalks, curbs and gutters, driveways, or similar concrete structures by tunneling underneath them. The CONTRACTOR will cut these concrete structures by using a concrete saw or, at his option, he may remove the section of the concrete structure to the nearest full expansion joint or edge.

901.5.2 PLASTIC PIPE INSTALLATION:

901.5.2.1 Plastic sewer pipe shall be connected and placed in the trench in accordance with the manufacturer's recommendations. Where a conflict arises with this Specification, this Specification shall control. Trenching, embedment, and backfill shall be as specified in Section 701.

901.5.2.2 The reference mark (a distinct circumferential line) is placed on the pipe's spigot end by the manufacturer to indicate the correct depth of spigot penetration into the pipe gasket joint. If the pipe is seated too deep or too shallow the pipe may buckle or separate due to thermal expansion/contraction. Spigot penetration shall be within 1/4" of the manufacturer's recommended mark.

901.5.2.3 For plastic pipe connection to manholes the CONTRACTOR shall install an appropriately sized press seal gasket, such as PS-10 by Press Seal Gasket Corporation, Large Diameter Waterstops for Concrete Manhole Adapters by Fernco, or approved equal. The gasket shall be installed per manufacturer's directions. No direct payment shall be made for this item; this cost shall be included in the pipe bid item price.

901.5.2.4 Not less than thirty (30) days after the installation and backfilling of plastic sewer pipe, including any service connections, the CONTRACTOR shall, in the presence of the ENGINEER, test deflection with a mandrel (GO - NO GO device). The mandrel shall be hand pulled. All pipe with deflections in excess of five percent of the base internal diameter, as determined by ASTM D 3034, ASTM F 679, or ASTM F 794, shall be excavated, pipe removed, new pipe installed,

backfilled, compacted and retested after an additional period of at least thirty days. Mandrels shall have 9 ribs and be only hand pulled through the test section. The CONTRACTOR shall furnish the mandrels. The length of the minimum radius portion of the mandrel shall not be less than the one-third of the nominal diameter of the pipe tested. The pipe shall be flushed and cleaned by the CONTRACTOR prior to testing. No flow will be permitted in the pipe while testing for deflections.

901.5.2.5 All expenses for trenching, removal of pipe, furnishing new pipe, installation of new pipe, compacted backfill, paving, and other related work that is required because of failure to meet deflection test requirements shall be borne by the CONTRACTOR.

901.5.2.6 Acceptance of plastic pipe sewers will be made only after these deflection test requirements have been met.

901.5.2.7 Minimum Diameters of Mandrels

901.5.2.7.1

<u>Nominal Pipe Size</u>	<u>Min. Mandrel Diam.</u>
8 in.	7.28 in.
10 in.	9.08 in.
12 in.	10.80 in.
15 in.	13.20 in.
18 in.	16.13 in.
21 in.	19.00 in.
24 in.	21.36 in.
27 in.	24.07 in.

901.6 JOINTS FOR PIPE

901.6.1 JOINTS FOR CLAY PIPE (FACTORY FABRICATED AND INSTALLED COMPRESSION-TYPE JOINTS FOR VITRIFIED CLAY PIPE):

901.6.1.1 Joint material shall be any one of the types specified in ASTM C 425 and shall meet all requirements of that specification and Section 125.

901.6.1.2 The CONTRACTOR shall furnish the ENGINEER complete information concerning the type and make of all joint material which he intends to use under the contract including certification that the joint material meets the requirements of these specifications.

901.6.1.3 In addition to all other tests required, the ENGINEER may select at random and perform the test on 2 joints for each 250 feet of pipe or fraction of each size of any lot of pipe to be tested.

901.6.1.4 The pipe joints shall not leak when subjected to the shear loading and hydrostatic tests as per ASTM C 425.

901.6.2 JOINT FOR CONCRETE PIPE:

901.6.2.1 The type of joint to be used shall be as shown on the drawings or as specified in the Supplementary Specifications.

901.6.2.2 Gasketed type of joints for circular reinforced concrete pipe shall be used (See Section 123).

901.6.2.3 Rubber gaskets for making compression type joints for circular concrete pipe shall be factory fabricated in accordance with ASTM C 443 and C 361; for circular pipes 12 inches in diameter and larger shall be rubber gasket and shall be handled, primed, installed, etc. in strict accordance with the manufacturer's recommendations.

901.6.2.4 The CONTRACTOR's attention is particularly called to ASTM C 443, regarding storage of gaskets.

901.6.2.5 The sealing of the plastic liner at the pipe joints shall be in strict accordance with Section 122.

901.6.2.6 The ends of the pipe shall be so formed that when the pipes are laid together and joined, they shall make a continuous and uniform line of pipe with a smooth and regular surface.

901.6.2.7 For elliptical or arch reinforced concrete pipe, the joints shall be tongue and groove. Mastic material, such as: RAMNEK, KENT SEAL, or approved equal, will be used to seal joints.

901.6.2.8 The CONTRACTOR shall furnish the ENGINEER complete information concerning the type and make of all joint material which he intends to use under the contract, including certification that the joint material meets the requirements of these specifications.

901.6.3 JOINT FOR PLASTIC SEWER PIPE (PVC):
901.6.3.1 Refer to ASTM D 2321 and ASTM F 794 for pipe laying and joining of pipe guidelines.

901.6.3.2 Prior to the laying of pipe, each pipe component shall be inspected for damage and

cleaned. Damaged components shall be rejected or repaired.

901.6.3.3 All joints will be assembled in accordance with manufacturer's published recommendations. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual joining resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint components and repeat the assembly steps. Note that fitting bells may permit less insertion depth than pipe bells. When mechanical equipment is used to assemble joints, care should be taken to prevent over insertion.

901.7 TESTING FOR LEAKAGE

901.7.1 GENERAL:

901.7.1.1 Unless otherwise shown on the drawings or specifically deleted by the ENGINEER, in writing, all sanitary sewers shall be tested for leakage.

901.7.1.2 The CONTRACTOR may, at his option, Air Test the sanitary sewer line before backfilling the trench to aid the CONTRACTOR in checking the installation for any defects. Such testing is at the option of the CONTRACTOR and shall not constitute an acceptance test under these specifications.

901.7.1.3 The test for acceptance and compliance with these specifications shall be performed after the pipe zone backfilling has been completed. In the case of new sanitary sewer lines with house laterals included as an integral part of the project, the test for acceptance and compliance with these specifications shall be performed after the house laterals or stubs have been completed and backfilled. The CONTRACTOR has the option to leave the end of the service line exposed.

901.7.1.4 If the leakage, as shown by the test, is greater than allowed by these specifications, the pipe shall be overhauled by the CONTRACTOR at his expense and, if necessary, relaid until the pipe will satisfactorily pass the test.

901.7.1.5 The CONTRACTOR shall, at his own expense, furnish all water, material, tools and labor for making the test required. All tests shall be made under observation of the ENGINEER.

901.7.2 INFILTRATION TEST:

901.7.2.1 An Infiltration Test shall be used only when excessive ground water prevents satisfactory testing by either the Exfiltration Test or the Air Test. In addition, the Infiltration Test must be performed after backfilling, before any service connections are functioning and at a time when the ground water is over the entire section of pipe and at or near its maximum level.

901.7.2.2 The procedure for conducting an Infiltration Test shall be as follows:

901.7.2.2.1 The pipe section shall be cleaned.

901.7.2.2.2 Determine the groundwater table. The groundwater table shall be determined for each section of sanitary sewer tested.

901.7.2.2.3 Plug the upstream pipe outlet from upstream manhole of the sections being tested with a plug which will assure a tight seal against flow from the upstream portion of the sewer system. Also plug all house laterals and any other connections to the section being tested.

901.7.2.2.4 Install a 90 degree V-notch weir in the downstream manhole of the section being tested. Weir must be installed plumb and sealed to the pipe wall surface.

901.7.2.2.5 A sufficient period of time must be allowed to permit the infiltrated waters to collect and flow over the weir. Water shall flow over the weir for at least thirty minutes prior to taking measurements.

901.7.2.2.6 The head (H) of water flowing over the weir must be measured accurately and the measurement taken at least 18 inches upstream from the crest of the weir.

901.7.2.2.7 Discharge over the 90 degree V-notch weir shall be calculated according to:

$$Q = 3240 H^{2.5}$$

H = Head in inches

Q = Discharge in gallons per day

901.7.2.3 The allowable infiltration shall be 200 gallons per inch of pipe diameter per mile of pipe per day. When there is significantly more than two feet of groundwater above the top of the pipe at the highest point of the section being tested, ten percent additional infiltration above the permitted 200 gal/in.-dia/mi/day limit will be allowed for every 2 foot of additional head.

901.7.3 EXFILTRATION TEST

901.7.3.1 An Exfiltration Test may be conducted wherever the groundwater level is below the crown of the pipe at the highest elevation of the section of sanitary sewer being tested. If the groundwater level is above the crown of the pipe either the Air Test, properly adjusted, or Infiltration Test should be used.

901.7.3.2 The procedure for conducting an Exfiltration Test shall be as follows:

901.7.3.2.1 The pipe section shall be cleaned.

901.7.3.2.2 Plug the downstream pipe outlet to the manhole with a plug which will assure a tight seal against water leakage. Also plug all house laterals and any other connections to the section being tested.

901.7.3.2.3 If the upstream manhole is to be used as a reservoir for maintaining the pressure head on the sewer pipe, the inlet sewer pipe or pipes must be plugged. If a standpipe is to be used as a reservoir for maintaining the pressure head on the sewer pipe, the standpipe must be connected to the sewer pipe in the upstream manhole by a tightly sealed connection.

901.7.3.2.4 The amount of water (volume required to fill the section of sewer under test plus the manhole or standpipe) shall be calculated.

901.7.3.2.5 Water shall then be introduced through the manhole or standpipe. The amount of water introduced shall be metered. The amount of water introduced to fill the sewer should be approximately equal to the calculated amount. If the amount of water required to fill the sewer pipe is significantly greater than the calculated amount, it is an indication of a leak or leaks and consequent saturation of the backfill around the sewer pipe. Saturation of the backfill will invalidate the test.

901.7.3.2.6 The level of water in the manhole or standpipe shall be at least two feet above the crown of the pipe at the highest section of the section of sanitary sewer being tested.

901.7.3.2.7 After filling the pipe at least one hour shall be allowed for water absorption in the pipe. For some materials, up to six hours may be required. After the absorption period, the manhole or standpipe shall be refilled to the established measuring mark and the test begun.

901.7.3.2.8 If the upstream manhole is used as a reservoir for maintaining the pressure head on the sewer pipe, the difference in water surface elevation

from original to final level in a two hour period shall be used to calculate the water lost. The water lost in the two hour period shall be converted into gallons per day. If a standpipe is used as a reservoir for maintaining the pressure head on the sewer pipe, the stand-pipe shall be refilled periodically during the two hour test period to maintain an essentially constant head on the test section of pipe. The amount of water added shall be measured and shall be used to calculate the loss in gallons per day.

901.7.3.2.9 The allowable exfiltration shall be computed based upon the average pressure head above the crown of the pipe for the section tested as follows:

$$\text{Allowable leakage} = \frac{\sqrt{h}}{\sqrt{3}} 1 \times 200$$

Allowable leakage in gallons per inch of pipe diameter per mile of pipe per day.

h = average pressure head above the crown of the pipe, in feet (elevation of water at center of run)

901.7.3.2.10 When the upstream manhole is used as a reservoir for maintaining the pressure head, the allowable leakage from the manhole shall be added to the allowable leakage calculated for the sewer pipe.

901.7.3.2.11 If the sanitary sewer line fails to pass the Exfiltration Test, a re-test shall be permitted only after the groundwater conditions surrounding the pipe return to a condition similar to those existent at the beginning of the test period. The groundwater elevation shall be determined prior to initiation of the second test.

901.7.4 AIR TEST:

901.7.4.1 An Air Test may be conducted under all conditions of groundwater levels surrounding the sanitary sewer pipe. If the groundwater is above the crown of the pipe, the air pressure shall be increased by an increment equal to the pressure exerted by the groundwater over the pipe.

901.7.4.2 The procedure for conducting an Air Test shall be as follows:

901.7.4.2.1 Clean the pipe section (manhole to manhole reach of sewer) being tested by propelling a snug-fitting inflated ball, or other adequate method, through the pipe with water. It is important that the pipe be thoroughly wetted if consistent results are to be expected.

901.7.4.2.2 Plug all pipe outlets with pneumatic plugs. The pneumatic plugs shall be able to resist internal testing pressures without requiring external bracing. Give special attention to house laterals.

901.7.4.2.3 Determine the groundwater level surrounding the section of sewer under test. If the groundwater level is above the crown of the pipe, the test pressures shall be increased by 0.43 psig for each foot of water above the average elevation of the crown of the pipe. Test pressures shall not exceed 10 psig.

901.7.4.2.4 Introduce air slowly to the section of pipe under evaluation until the internal air pressure is raised to 4.0 psig plus any increase required by a high groundwater level.

901.7.4.2.5 Allow the air pressure to stabilize. Air may be added slowly to maintain a pressure in the 3.5 to 4.0 psig (plus groundwater allowance) for two minutes.

901.7.4.2.6 After the stabilization period, when the pressure reaches exactly 3.5 psig (plus groundwater allowance) the stopwatch is started and when the pressure reaches exactly 2.5 psig (plus groundwater allowance) the stopwatch is stopped.

901.7.4.2.7 If the time required for a one pound pressure drop is not less than the allowable time for the pipe section under test to lose air, the section shall pass the leakage test.

901.7.4.2.8 In all cases where an Air Test is conducted, the manholes shall be tested separately as previously specified.

901.7.4.2.9 All persons conducting an Air Test must be made aware of the fact that an Air Test may be dangerous if improperly conducted.

901.7.5 AIR TESTING TABLES: Tables 901.7.5.1 and 901.7.5.2 will be used to determine the required test duration for the section of line being tested.

TABLE 901.7.5.1

SPECIFICATION TIME REQUIRED FOR 1.0 PSIG PRESSURE
DROP FOR SIZE AND LENGTH OF PIPE
INDICATED FOR Q=0.0015

(A) Pipe Diameter (in.)	(B) Minimum Time (min:sec)	(C) Length for Minimum Time (ft)	(D) Time for length (sec)	(E) Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Table from: UNI-B-6-79, "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe"; Uni-Bell Plastic Pipe Assoc.

TABLE 901.7.5.2

SPECIFICATION TIME REQUIRED FOR LOSS OF PRESSURE
FROM 3.5 PSIG TO 2.5 FOR SIZE AND
LENGTH OF PIPE INDICATED FOR Q=0.003

(A) Pipe Diameter (in.)	(B) Minimum Time (min:sec)	(C) Length for Minimum Time (ft)	(D) Time for length (sec)	(E) Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:48	11:24	12:49
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	23:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:3	115:23
39	18:25	61	18.054 L	30:57	45:09	60:11	75:14	90:16	105:1	120:2	135:24
42	19:50	57	20.039 L	34:54	52:21	69:48	87:15	104:4	122:0	139:3	157:05
								2	9	6	

Table from: WPCF Journal, Vol. 44, No. 4, April 1972; Ramseier, "Testing New Sewer Pipe Installations"; pp. 557-564.

901.7.5.3 EXPLANATION AND USE OF TABLES

Explanation of Tables

Column A	Nominal diameter of pipe (any pipe material).
Column B	Minimum duration of air test regardless of length of line segment being tested. (e.g., 250' of 8" PVC: test duration 3 min. 47 sec.)
Column C	Length of Line associated with minimum duration of air test (Column B).
Column D	L = length of line in feet; product of computation yields duration of air test (e.g., 250' of 12" PVC where ground water is not present ([Table 901.7.5.1]: test duration-- $1.709 (250) = 427.25$ sec. = 7 min. 8 sec.)
Column E	Duration of air test for given incremental lengths of line.

Use of Tables

Table 901.7.5.1 is based on an air loss rate of 0.003 cfm/sf of internal surface area. Use for line installations where ground water (and subsequent infiltration) is not present.

Table 901.7.5.2 is based on an air loss rate of 0.0015 cfm/sf of internal surface area. Use for line installations where ground water (and subsequent infiltration) is present

901.8 CLEANING AND INSPECTION

901.8.1 CLEANING: No pipe spalls, rocks, dirt, joint compounds, cement mortar and other trash or obstructions shall be left in a sewer pipe of any size or type. During the flushing operations the manhole outlet shall be bagged or plugged so that this debris will not be carried into or contaminate an existing or active line.

901.8.2 TELEVISION:

901.8.2.1 All completed sewer lines shall be inspected by a television camera before lines become operational or final acceptance of the installation.

901.8.2.2 After the CONTRACTOR has cleaned flushed and retrieved all debris in the line, the CONTRACTOR will notify the project engineer that the line is ready for television inspection. The CONTRACTOR in the presence of the ENGINEER or the engineer's representative shall televise the line with televising equipment specifically designed and constructed for sewerline visual inspection.

The television camera shall be of color and equipped with a rotating lens capable of 360-degree rotation with zoom focus and a wide-angle optical lens permitting spontaneous focal

adjustments, allowing viewing of service lateral connections, joints, pipe walls, etc.

A television report log, completed on the OWNER'S log form, shall be maintained during the television inspection. This log shall be completed to the OWNER'S satisfaction noting the location, project title, name of OWNER, date, type of pipe material, line size, location of services (live or stubouts), manhole or station numbers, and any abnormal or line defects within the line segment. The CONTRACTOR shall be responsible for subsequent televising when line repairs are required or when the previous televising is not satisfactory to the OWNER.

When the televising is complete, the CONTRACTOR shall turn over to the OWNER complete television report logs and the VHS videotape recordings.

901.9 MEASUREMENT AND PAYMENT

901.9.1 SANITARY SEWER PIPE: Installed pipe shall be measured and paid for as follows:

901.9.1.1 For straight lines the pipe length shall be the intervening distance between the centers of manholes along a line parallel to the pipe invert.

901.9.1.2 For curvilinear lines the pipe length shall be the intervening arc distance between the

centers of manholes along a line parallel to the pipe invert.

901.9.1.3 For lateral lines, such as from main or manhole to a storm inlet, the pipe length shall be the distance between the center of a manhole or centerline of the main to the interior wall face of the storm inlet along a line parallel to the pipe invert.

901.9.1.4 Payment for pipe will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: pipe installed in the trench, jointing and coupling materials, and other materials necessary to connect to other sections of pipe, manholes, and other appurtenances.

901.9.2 CONNECTIONS: Connections, tying new sewer lines into existing manholes, shall be measured and paid for on a unit price per each within the size increments as specified in the Bid Proposal. Connections to the shelf section of the floor will not be considered for payment under this bid item.

901.9.3 VERTICAL DROPS: Vertical drops at manholes shall be measured by the linear foot of pipe from the invert of the sewer line to be dropped to the spring line of the receiving main. Payment will be made on the unit price per linear foot per size and type of pipe as specified in the Bid Proposal.

901.9.4 TESTING:

901.9.4.1 Infiltration, ex filtration, and air tests of sewer mains shall include sewer service lines to the property lines or right-of-way lines as installed per the construction plans. No payment will be made for the initial test or subsequent tests.

901.9.4.2 Television inspection is defined in Subsection 801.8.2.

901.9.4.3 There will be no payment for required testing of sanitary sewer manholes.

901.9.4.4 No payment will be made for deflection tests after the required waiting period for PVC sewer pipe installations.

901.9.5 REMOVAL AND DISPOSAL OF SEWER PIPE: Removal and disposal of sanitary or storm sewer lines shall be measured by the linear foot within the specified pipe size increments. Payment will be made on the unit price per linear foot of specified pipe size in the Bid Proposal. No payment will be made until delivery of salvageable materials is verified by Liquid Waste Division.

Trenching, backfilling, and pavement removal and replacement will be paid for based on the unit prices for each appropriate bid item in the Bid Proposal. If new pipe is to be installed in the same trench as the removed pipe, only one payment will be made for trenching, backfilling, and pavement removal and replacement.

SECTION 920

SANITARY AND STORM SEWER MANHOLES

920.1 GENERAL

This section contains items which are relative to the installation of sanitary and storm sewer manholes.

920.2 REFERENCES

920.2.1 ASTM

C 43	C 497
C 139	C 1557
C 478	

920.2.2 This publication

SECTION 101	SECTION 106
SECTION 102	SECTION 161
SECTION 105	

920.3 MANHOLE MATERIALS

Sewer manhole materials shall be as specified in other sections, as follows:

Portland Cement Concrete	Section 101
Steel Reinforcing	Section 102
Concrete Curing Compound	Section 105
Cement Mortar and Grout	Section 106
Gray Iron Castings	Section 161

920.4 MANHOLE CONSTRUCTION

920.4.1 GENERAL:

920.4.1.1 Soil Foundations for manhole base shall be compacted to a density of 95 percent of the maximum density per ASTM D 1557. Compaction limits shall be one foot beyond the perimeter of the concrete base and shall be a minimum of one foot in depth.

920.4.1.2 Manholes shall be constructed in accordance with the Standard Detail Drawings and as shown on the construction plans. Precast reinforced concrete units, concrete blocks or formed in place, reinforced concrete may be used to construct the manhole.

920.4.1.3 Invert elevation of the pipes entering or exiting the manhole and interior inverts shall not vary more than 0.05 foot from the elevations indicated on the construction plans.

920.4.1.4 All cement used for poured foundations. Mortar, fillets, grout, and concrete shelf construction shall be Type II or approved equal.

920.4.1.5 All concrete for formed in place foundations or bases, concrete shelves, and pipe supports shall be 3000 psi compressive strength concrete.

920.4.1.6 Depending on the size of the pipe, connections to existing and new manholes shall be made by either core drilling through the manhole wall, per-formed for new precast units, or for large-size pipe the manhole wall may be removed by carefully chipping the wall segment which will permit entry of the pipe. In the latter operation, exposed manhole reinforcement should be bent and tied to the reinforcement of the pipe collar. If core drilling is not practical, the CONTRACTOR shall request the ENGINEER to authorize the chipping operation. During either operation the CONTRACTOR shall take care to avoid unnecessary damage to the manhole surfaces or walls.

920.4.2 PRECAST CONCRETE MANHOLES:

920.4.2.1 The vertical sections of the manhole may be of different dimensions in order that manholes of various depths can be readily assembled.

920.4.2.2 Concrete, used for precast bases, vertical sections, and eccentric cones, shall be 4000 psi compressive strength concrete.

920.4.2.3 Vertical sections of the manhole shall conform to the requirements of ASTM C 478.

920.4.2.4 The CONTRACTOR shall submit shop drawings of the precast base and eccentric cone to the ENGINEER for review and approval.

920.4.2.5 Circular precast manhole sections shall be provided with mastic gasket to seal joints between sections, such as RAM-NEK, KENT SEAL, or approved equal.

920.4.2.6 All lifting holes, except Type "C" manhole covers, and gaps at joints shall be filled with a nonshrink grout.

920.4.2.7 Precast concrete manhole bases may be used when approved by the ENGINEER. If approved, it shall be with the understanding that the CONTRACTOR shall be responsible for placing the bases at the specified elevation, location, and alignment.

920.4.3 FORMED INPLACE REINFORCED CONCRETE MANHOLE:

920.4.3.1 The CONTRACTOR shall submit preconstruction drawings of the proposed manholes to the ENGINEER for review and approval.

920.4.3.2 Concrete used for this type of manhole construction shall be 4000 psi compressive strength concrete.

920.4.3.3 If desired, a precast eccentric cone or a flat cover can be used.

920.4.4 CONCRETE BLOCK MANHOLE:

920.4.4.1 The CONTRACTOR shall submit preconstruction drawings of the proposed manhole to the ENGINEER for review and approval.

920.4.4.2 Concrete masonry units for the construction of this type of manhole shall conform to ASTM C 139 and the Standard Detail Drawings. All blocks shall be mortared into place.

920.4.4.3 Eccentric cone or flat-type cover shall be used.

920.4.5 TEE PIPE MANHOLE:

920.4.5.1 Tee pipe manholes will be used for all 4-foot-diameter mainline pipes and larger. Horizontal section of the tee pipe shall be the same class of pipe as the adjacent sections. The vertical sections shall comply with the requirements set forth in ASTM C 478.

920.4.5.2 Top of the vertical portion of tee pipe unit will extend a minimum of 18 inches above the outside diameter of the horizontal pipe. The 4-foot-diameter vertical section of the tee pipe shall be connected at the longitudinal center point of the horizontal pipe section. The minimum length of horizontal pipe section shall be 8 feet.

920.4.5.3 The CONTRACTOR shall submit to the ENGINEER for review and approval preconstruction shop drawings on the fabrication of the tee pipe section as developed by a precast reinforced concrete pipe manufacturer. Field fabrication of this eccentric pipe unit will not be accepted. Shop drawings for the eccentric cone will also be submitted for review and approval.

920.4.5.4 RAM-NEK, Kent Seal, or OWNER - approved equal sealants shall be used to seal the joints in the vertical portion of this manhole.

920.4.5.5 All lifting holes, except for Type "C" manhole covers, and gaps at joints shall be filled with a nonshrink grout.

920.4.5.6 Standard Detail Drawings show some of the components of the tee-type pipe manhole.

920.4.6 COATING OF MANHOLES:

920.4.6.1 Exterior of Manholes: Exterior coating of manholes shall be required in areas where ground water is present. The coating shall be a waterproofing type of bitumastic or asphaltic material, as approved by the ENGINEER. Application shall be in accordance with the manufacturer's published recommendations.

920.4.6.2 Interior of Manholes: Interior coating of manholes shall be required only when specified on the construction plans. The coating shall be an epoxy resin-type material, be an epoxy resin-type material such as: "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.

920.4.6.3 Plastering of Manholes: The work shall include the coating of the surface of existing block manholes with plaster as required on the plans.

920.4.7 MANHOLE STEPS:

920.4.7.1 Manhole steps shall be 1/2" diameter, grade 60, reinforcing rod completely encapsulated in copolymer polypropylene or corrosion resistant rubber compound. Steps shall be designed to be cast in place or hammered into holes in manhole walls.

920.4.7.2 Approved manhole steps of only one manufacturer model shall be used on any specific project and shall not be intermixed with other approved steps. Approved steps must bear the manufacturer name and model on the exposed surface of the step and shall be one of the following products or approved equals: M.A. Industries, Inc. -Model PS-2-PFS H. Bowen Co.-Bowco, Model 81213 or 93813 Delta Pipe Products -WEDG-LOK, Model W-II

920.4.7.3 The minimum width of step tread shall be 11 inches. Steps will be spaced uniformly in each manhole. Spacing may be between 12 inches to 16 inches on center. Lower step will be 12 inches above manhole shelf or top of main. The upper step shall be 6 inches below the top portion of the eccentric cone or 6 inches below the bottom

of the flat cover. Also the steps shall be aligned vertically with the opening of the cone or cover.

920.4.7.4 Steps shall be embedded in the manhole wall a minimum of 3" inches and protrude from the manhole interior surface a minimum of 4 3/4 inches.

920.4.7.5 Holes for step installation shall be drilled or precast per manufacturer's recommended size. or of sufficient size to allow for step insertion into the wall. Cast-in-place sockets or tapered holes recommended by the step manufacturer may be used with prior approval of ENGINEER. If the hole has been drilled too large, then the step shall be secured in place by using epoxy grout for the full depth of the drilled hole.

920.4.6 Acceptable manhole step installations must be capable of withstanding a 400 pound, horizontal, pull out load applied in accordance with ASTM C-497.

920.4.8 ADJUSTMENT BRICKS:

920.4.8.1 Manhole adjustment bricks shall conform to the requirements for manhole bricks. per ASTM C 32 for Grade MS.

920.4.8.2 Mortar shall be used to lay the bricks. as well as coating the interior and exterior surfaces of the laid brick. Thickness of the mortar coating shall be 1/2 inch.

920.4. 9 MANHOLE FRAME AND COVER:

The manhole frame and cover for either the sanitary or storm sewer manholes shall conform to the specifications contained in Section 161.

920.5 TESTING OF SEWER MANHOLES:

920.5.1 All sanitary sewer manholes shall be tested for leakage by either a water exfiltration test or a vacuum test. Whichever test is utilized it is recommended that the test be performed prior to backfilling around the manhole and prior to placement of the manhole frame and cover. All inlet and outlet lines shall be properly plugged and the lift holes and barrel joints filled and sealed as specified. The CONTRACTOR shall be responsible for all materials and equipment necessary to perform the test and shall conduct the test in the presence of the ENGINEER or his representative. The CONTRACTOR has the option of performing a manhole test in increments appropriate to the depth of the manhole.

920.5.2 The water exfiltration test shall consist of filling the entire manhole with water to the bottom of the frame elevation. A stabilization period of one hour will be allowed for absorption. After which the manhole shall be refilled as necessary before starting the test. The test period shall be two (2) hours. After which the manhole shall be refilled, measuring the necessary quantity of water. The allowable leakage shall be 0.25 gallons per foot diameter per vertical foot per day, and is represented by the following formula:

$$V = 0.25 \text{ DHT}/24$$

where; V = Allowable loss in gallons

D = Manhole diameter in feet

H = Initial depth of water to invert in feet

T = Duration of test in hours

920.5.3 The vacuum test shall consist of utilizing an inflatable compression band, vacuum pump, gauges and appurtenances specifically designed for vacuum testing. Test procedures shall be in accordance with the manufacturer's printed recommendations. The ENGINEER shall be the sole judge as to the adequacy of the equipment.

920.5.3.1 A vacuum of 10" Hg shall be placed in the manhole and the time measured for a drop to 8.5" Hg. The test shall be considered to be successful if the measured time exceeds the test period. Should the test fail, the man- hole shall be repaired as necessary and the test rerun. The test periods are:

920.5.3.2 Sixty (60) seconds for four (4) foot diameter manholes.

920.5.3.3 Seventy-five (75) seconds for five (5) foot diameter manholes.

920.5.3.4 Ninety (90) seconds for six (6) foot diameter manholes.

920.5.3.5 One hundred and Twenty (120) seconds for eight (8) foot diameter manholes.

920.5.4 Normally storm sewer manholes need not be tested unless specifically required by the project plans or supplemental technical specifications. However, if in the opinion of the ENGINEER, the workmanship or materials do not appear to be satisfactory, the ENGINEER may require that any storm sewer manhole be tested in a similar manner as that for a sanitary sewer manhole.

920.6 ABANDONMENT OF MANHOLES

920.6.1 Abandonment of manhole, which is part of a sewer line being abandoned, shall entail the following work and materials:

920.6.2 Manhole will not be removed but will be abandoned in place.

920.6.3 All manhole inlet and outlet lines shall be plugged with a 12-inch- thick concrete or concrete mortar plug.

920.6.4 Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to arrange for a representative to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR as directed by the OWNER. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be disposed of by the CONTRACTOR.

920.6.5 Manhole bottom will be pulverized.

920.6.6 The manhole shall be filled with cement treated base (CTB) material to the bottom elevation of the asphalt base course of the pavement or to the ground surface level.

920.6.7 All labor, materials, and equipment necessary to complete this work shall be furnished by the CONTRACTOR.

920.6.8 For historical information the ENGINEER shall have a survey performed which will locate the abandoned manhole, relative to permanent survey markers.

920.7 SEWER MANHOLE REHABILITATION IN REPLACEMENT WORK

920.7.1 The work under this item shall be to replace the existing manhole frame and cover and to place a concrete pad around the existing manhole as required per the construction plans. This work will be done only when an existing manhole is encountered in the normal course of the replacement work that has a light- weight, vented, multi-holed manhole cover.

920.7.2 The work and materials shall include the following:

920.7.2.1 Remove any and all existing brick under frame and replace with new Grade MS brick as necessary to bring new frame and cover up to street grade.

920.7.2.2 Remove and replace existing concrete pad, or construct a new pad.

920.7.2.3 Remove existing steps and replace with new steps or, if steps are nonexistent, install new steps. Steps will be installed as per Subsection 815.4.7.

920.7.2.4 Remove and replace pavement.

920.7.2.5 Excavation and compaction of backfill as necessary.

920.7.2.6 All materials, labor, and equipment necessary to do the work under this item shall be furnished by the CONTRACTOR.

920.7.2.7 The work and materials under this item shall be done according to the manner set forth in the Standard Detail Drawings and other sections of these specifications.

920.7.3 Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to arrange for a representative to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR as directed by OWNER. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be disposed of by the CONTRACTOR.

920.8 MEASUREMENT AND PAYMENT

920.8.1 NEW MANHOLES:

920.8.1.1 Type "C," "E," "F," or "G" manholes of 4-foot or 6-foot diameters shall be measured per each within the following increments of depth: 3 to 6 feet, 6 to 10 feet, and 10 to 14 feet. Manholes which are greater in depth than 1 foot shall be measured by the vertical foot. Measurements will be made to the nearest foot and will be from the manhole rim elevation to the manhole invert elevation.

920.8.1.2 Payment for manholes 14 feet deep or less will be made on the unit price per manhole diameter per depth increment as specified in the Bid Proposal. Payment for manhole depths which exceed 14 feet will be made on the unit price per manhole diameter per vertical foot. This payment is in addition to the manhole unit price for the portion above the 14 foot depth.

920.8.1.3 Type "A" or Tee-type manholes shall be measured and paid for by the methods described

in 920.8.1.1 and 920.8.1.2. Measurement will be from the invert of the main line to the manhole rim. Payment under this item will include the normal manhole costs described below, as well as any additional pipe costs for the precast tee and for the concrete cradle under the tee.

920.8.1.4 Payment for any type diameter or depth of manhole will include excavation, compacted backfilling, shelving, cover or cone, leveling bricks, frame and cover, and concrete pad or collar.

920.8.2 ELEVATION ADJUSTMENTS:

920.8.2.1 When a new manhole is installed, no measurement or payment will be made for rim elevation adjustments to conform to street surface grades.

920.8.2.2 The following measurements and payments for rim elevation adjustments on existing manholes will be made for indicated conditions:

920.8.2.2.1 Unit price per inch of adjustment ring for adjustment to manhole frame by the addition of adjustment ring.

920.8.2.2.2 Unit price per inch of leveling brick adjustment.

920.8.2.2.3 Unit price per manhole diameter per vertical foot of adjustment to cone and/or barrel.

920.8.2.3 As required, the following items will be included in the unit price per appropriate adjustment: pavement removal and replacement, excavation, compacted backfilling, concrete collar or pad, leveling bricks, adjusting rings, and/or frame and cover.

920.8.3 COATING OF MANHOLE: Plastering or epoxy coating for manholes shall be measured and paid for on the unit price per square foot of surface area covered.

920.8.4 MANHOLE STEPS: Unless otherwise shown on the Bid Proposal, the cost of manhole steps shall be incidental to the unit prices for construction of manholes of various types and depths.

920.8.5 ABANDONMENT OF MANHOLES: Measurement and payment for abandonment of a manhole shall be the unit price per manhole for defined work in Subsection 920.6.

920.8.6 MANHOLE REHABILITATION IN REPLACEMENT WORK: Work under this item shall be measured and paid for by the unit price per manhole for work specified in the Bid Proposal.

920.8.7 TESTING: There will be no payment for required testing of sewer manholes.

SECTION 925

VACUUM SEWER COLLECTOR, INTERCEPTOR AND FORCE MAIN FACILITIES

925.1 GENERAL: The construction items specified in this section are common to vacuum sewer facilities.

925.2 REFERENCES

925.2.1 American Society for Testing and Materials (ASTM) Standard Specifications, Latest Edition

- C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
- D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
- D1784 Standard Specification for Rigid Poly (PVC) Compounds and Chlorinated Poly (CPVC) Compounds
- D2241 Standard Specification for Poly (PVC) Pressure-Rated Pipe (SDR Series)
- D2564 Standard Specifications for Solvent Cements for Poly (PVC) Plastic Piping Systems
- D2665 Standard Specifications for Poly (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
- D2672 Standard Specifications for Joints for IPS PVC Pipe Using Solvent Cement
- D3139 Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

925.2.1 This Publication, Latest Edition

- SECTION 101 PORTLAND CEMENT CONCRETE
- SECTION 102 STEEL REINFORCEMENT
- SECTION 105 CONCRETE CURING COMPOUND
- SECTION 106 CEMENT MORTAR AND GROUT
- SECTION 108 BRICK
- SECTION 121 PLASTIC PIPE
- SECTION 161 GRAY IRON CASTINGS
- SECTION 170 ELECTRONIC MARKER DISKS
- SECTION 701 TRENCHING, EXCAVATION AND BACKFILL
- SECTION 710 BOARING, DRILLING, AND JACKING
- SECTION 801 INSTALLATION OF WATER TRANSMISSION, COLLECTOR AND DISTRIBUTION LINES

925.3 MATERIALS

925.3.1 PIPE: All buried vacuum collector lines, branch lines, force mains, vacuum service laterals, and gravity service stubs shall be SDR21 rated PVC pipe conforming to ASTM D 2241, ASTM D 1784 Cell Classification 12454-B. Pipe and appurtenances shall be new and unused.

925.3.2 JOINTS: All joints shall conform to ASTM D 2672, using solvent cement; or ASTM D 3139 using elastomeric seals. This pipe must be certified by the manufacturer that pipe and seal will operate at 24 inches of mercury vacuum and withstand a vacuum test at 24 inches of mercury vacuum with a maximum loss of 1% of initial vacuum per hour for a 4 hour period.

925.3.3 FITTINGS

925.3.3.1 Fittings shall be Schedule 40 solvent weld drain, waste and vent pipe per ASTM D 2665.

925.3.3.2 Wye fittings and 45° ells shall be used throughout; except that a long radius 3" 90° ell may be used on the 3" suction line entering the vacuum valve and at the wye connection of the vacuum service lateral to the vacuum main. Tee fittings and short radius ells are prohibited exclusively.

925.3.4 SOLVENT CEMENT: Shall conform to ASTM D 2564; primer and cement shall not be of same color. Cement shall be gray in color.

925.3.5 MANHOLE SECTIONS: Manhole sections used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall be reinforced precast concrete manhole sections, 48" nominal diameter, conforming to the requirements of ASTM C 478.

925.3.6 MANHOLE JOINTS: Tongue and groove in precast wall; shall conform to Section 920, PRECAST CONCRETE MANHOLES.

925.3.7 MANHOLE FRAMES AND COVERS: Frames and covers for manholes used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall conform to this Publication, Section 161.4. The words "SEWER" shall be cast on the manhole cover.

925.3.8 CAST-IN-PLACE CONCRETE: Cast-in-place concrete used for footings, flotation collars, grade-level pads, mass concrete for buffer tanks, and other installations not otherwise addressed shall be air-entrained concrete in accordance with Sections 101, 102, and 105 of this Publication, with a compressive strength of 3500 psi. Type II Portland cement shall be used for all applications where the concrete will be in contact with sewage. See Section 1502, SUBMITTALS.

925.3.9 VALVES: Valves used for pig launchers and

vacuum division valves shall be mechanical joint gate valves conforming to Sections 801.3.3.1 through 801.3.3.9 of this Publication. Vacuum division valves shall be equipped with five-sided nuts, sockets and extension bars per Standard Drawing 2169.

925.3.10 AIR RELEASE VALVES: Air release valves shall be APCO or approved equal, the model number per the construction drawings.

925.3.11 VACUUM VALVES AND APPURTENANCES: Vacuum valves shall be per the construction drawings. Furnish all mechanical appurtenances required for a complete installation per manufacturer specifications. Vacuum valves and appurtenances are to be delivered to the OWNER's warehouse, unloaded, and stored as directed by the ENGINEER in complete packages.

925.3.12 VACUUM VALVE PITS

925.3.1.2.1 Vacuum valve pits shall be either "standard" or "deep" per the appropriate bid item.

925.3.1.2.2 The standard valve pit shall have a sump 30" deep and shall be per the construction drawings. The deep valve pit shall have a sump 54" deep and shall be per the construction drawings.

925.3.13 STAINLESS STEEL: Stainless steel for brackets and fasteners shall be AISI Type 304.

925.4 SUBMITTALS

925.4.1 The following shall be submitted for the ENGINEER'S approval prior to incorporation in the work of the corresponding item:

- a) Concrete Mix Design(s)
- b) Material and method of sealing pipe penetrations in buffer tank walls
- c) Pipe certification for vacuum service

925.4.2 The OWNER/ENGINEER will be supplied with a certificate of compliance for each item or type of material required in the system, as to that item meeting the specifications and/or the reference specifications before that item is installed.

925.4.3 The following records shall be maintained by the CONTRACTOR, shall be kept available at all times for inspection by the ENGINEER, and shall be submitted to the ENGINEER at his request or as provided in these Specifications.

925.4.3.1 Vacuum tests performed daily or as otherwise stipulated. These tests shall be recorded on

charts provided by the OWNER or in hard-board notebooks as stipulated herein depending on the type of test.

925.4.3.2 Record Drawing markups and related survey notebooks kept current by the CONTRACTOR to record work performed and to reflect any and all revisions made from the original drawings.

925.5 INSTALLATION

925.5.1 GENERAL

925.5.1.1 Handle pipe and appurtenances in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken to prevent damage to any coating.

925.5.1.2 Prior to installation, store plastic pipe and protect from prolonged periods of sunlight per Section 121.

925.5.1.3 The interior of the pipe, pits, and all appurtenances shall be thoroughly cleaned of foreign material before being lowered into the trench and shall be kept clean during construction operations.

925.5.1.4 Install a plug in the new system at any point of connection to an existing system. The plug shall remain in place until the ENGINEER and OWNER authorize its removal in writing. The CONTRACTOR shall not flush or otherwise discharge any flow into an existing system unless approved in writing by the ENGINEER.

925.5.1.5 Perform trenching, backfilling, and compaction in accordance with Section 701.

925.5.2 PIPE INSTALLATION

925.5.2.1 All vacuum sewers shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. All pipe which has been designed to slope downward shall slope uniformly downward, with a tolerance of no more than 0.01' per 20 feet of line. Abrupt sags or bellies will not be permitted. The elevation of each joint of pipe shall be recorded by the CONTRACTOR in bound field books which shall be submitted to the ENGINEER.

925.5.2.2 All sanitary sewer force mains shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. Particular care shall be taken to avoid crests in the profile at locations other than those shown on the drawings. Elevations shall be recorded by the CONTRACTOR at 100-foot intervals, and at each change in grade, in bound field books which shall be submitted to the ENGINEER.

925.5.2.3 Handle and install pipe and fittings in accordance with manufacturer's recommendations.

925.5.2.4 Prevent entrance of dirt or foreign matter or damage to pipe lining or coating. Plug the pipe any time work is stopped.

925.5.2.5 No defective pieces are permitted. Defective pieces discovered after use will be removed and replaced with a sound piece.

925.5.2.6 Place bedding, embedment and backfill in accordance with Section 701 unless otherwise indicated on the drawings. The bedding of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. Suitable excavation shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to the line and grade shall be made by scraping away or filling in with pipe zone material under the body of the pipe, but not by wedging or blocking. When connections are to be made to any existing pipe, valve pit, or any other improvement, the actual elevation or position of which cannot be determined without excavation, excavate and expose the existing improvement before laying the connecting pipe or conduit. When existing underground improvements may reasonably be expected to conflict with the line or grade established for the new sewer line, the ENGINEER shall request the CONTRACTOR to excavate as necessary to expose such potentially conflicting underground improvements prior to laying the new pipe. Any adjustment in line or grade which may be necessary to accomplish the intent of the plans will be made, and the CONTRACTOR will be paid for any additional work resulting from such change in line or grade in the manner provided for in the GENERAL CONDITIONS.

925.5.2.7 Lay pipe upgrade in a continuous operation from structure to structure, with the socket ends of the pipe upgrade unless otherwise permitted by the ENGINEER.

925.5.2.8 Sanitary sewer mains shall not be constructed under walkways, sidewalks, curbs and gutters, drive pads, or similar concrete structures by tunneling underneath them. Cut concrete by using a concrete saw or, at the CONTRACTOR'S option, remove the entire section of concrete to the nearest full expansion joint or edge.

925.5.2.9 Place and hand-tamp fill to 95% of maximum dry density per ASTM D 1557, in entire space between the pipe or fitting and the trench walls.

925.5.2.10 Prior to completely backfilling the sewer excavation, install a green metalized plastic

tracer/warning tape 12" to 18" below finished grade.

925.5.2.11 Mark the ends of all wyes, branch lines, and gravity service stubs that are installed for future connections to the system. Attach a stainless steel marker with stainless wire to the stubout end and place the marker within 8" to 12" of finished surface for future relocation of stubout.

925.5.2.12 Provide pipe through casing with support skids as shown on the drawings and Standard Drawing No. 2380. Alternate support methods may be acceptable upon ENGINEER'S review and approval.

925.5.3 DIVISION VALVE AND GAGE TAP INSTALLATION: Division valves, vaults, and gage tap assemblies shall be installed per Standard Drawing No. 2170.

925.5.4 VACUUM VALVE PIT INSTALLATION

925.4.4.1 Install complete vacuum valve pits in accordance with manufacturer instructions and Standard Drawing No. 2165. Perform pressure testing on each valve pit assembly per the manufacturer instructions.

925.4.4.2 Stubouts for the gravity line from the collection sump should be 4" diameter, extended to the property line unless otherwise indicated. Each stub-out should have a stop glued in place 4" to 6" from the end inserted into the tank, to prevent it being pushed too far into the collection sump. A solvent welded 4" cap should be fitted and glued to each stub-out to prevent rocks and groundwater entering the sump prior to connection of the house gravity line. Expandable test plugs or rubber caps are not acceptable as temporary covers for gravity stub-outs.

925.5.5 SINGLE OR DOUBLE BUFFER TANK INSTALLATION

925.5.5.1 Install single or double buffer tank as shown on the drawings and Standard Drawing 2167 (single) or 2168 (double).

925.5.5.2 All pipe penetrations through the buffer tank walls shall be water tight. Submit manufacturer's literature on material and technique for sealing to the ENGINEER.

925.5.5.3 Install suction and sensor pipes as shown on the Standard Drawings. Attach these lines to the buffer tank side walls using Type 304 stainless steel brackets and fasteners. The 3" service lateral is to be stubbed into the buffer tank and capped or otherwise sealed until the vacuum valve is installed.

925.5.5.4 Install breather pipe through buffer tank

wall as shown on Standard Drawing No. 2166. This line is to be capped or otherwise sealed to prevent any infiltration of water during construction. It shall be tested in accordance with Breather Test Procedure, Paragraph 925.8.

925.5.5.5 Buffer tanks shall be tested after assembly. The entire buffer tank shall be tested as follows:

925.5.5.5.1 Stubouts, manhole boots, and pipe plugs shall be permanently secured to prevent movement while the vacuum is drawn.

925.5.5.5.2 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.5.5.5.3 Using CONTRACTOR furnished vacuum pump and gage, establish a measured vacuum of 10 inches of mercury in the buffer tank. Record the time for the vacuum to drop to nine inches of mercury.

925.5.5.5.4 The maximum allowable leakage rate for a four foot diameter manhole shall be in accordance with the following:

Min. Elapsed Time for a Pressure Manhole Depth Change of 1" Hg
10' or less 60 seconds
>10' but <15' 75 seconds
≥15' but <25' 90 seconds

925.5.5.5.5 If the buffer tank fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the tank passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the ENGINEER. Leaks shall be repaired on the outside of the manhole unless otherwise approved by the ENGINEER.

925.5.5.5.6 If a buffer tank joint mastic is pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

925.5.5.5.7 Record test results on a calibrated chart recorder as described in Section 925.6, Field Quality Control.

925.5.6 INSTALLATION OF CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN: Casing for sanitary sewer vacuum main or force main shall be per the drawings and Standard Drawing No. 2380 and per Section 710 of this Publication.

925.6 FIELD QUALITY CONTROL

925.6.1 Provide daily testing of all sewer mains and

lateral connections laid. Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings. Using OWNER-furnished vacuum pump and chart recorder, apply a vacuum to 24 inches of mercury to the pipes with pump running continuously for 15 minutes to allow vacuum to stabilize before proceeding with test. There shall be no loss in excess of 1% of initial vacuum per hour for a two hour test period. As pipe is laid the new section shall be tested in addition to the previously laid pipe on that main.

925.6.2 Leave uncovered the sewer main pipe joints until after the daily vacuum test is complete so that any leaks can be easily located and repaired. Exposed joints shall be adequately restrained.

925.6.3 Two hour Vacuum Line Test Modification Provision: If the CONTRACTOR succeeds in meeting the daily 2-hour test for seven consecutive working days or two thousand feet of pipe, the ENGINEER may amend the procedure to allow the trench to be covered as work progresses rather than the trench being kept open all day as is the norm with the daily 2-hour test. Should a line fail the vacuum test while utilizing this test modification, the CONTRACTOR shall take whatever action is necessary at his cost to pass the test including the excavation of the trench, leak detection and line repair, and additional cleanup as required by the ENGINEER. After the failure, the CONTRACTOR must re-qualify as specified above. Note this test modification is optional, and as such, the CONTRACTOR assumes all liability in its use. Allowance of this modification by the ENGINEER is not considered acceptance of the sewer line or ability to withstand test vacuum pressures.

925.6.4 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.6.5 Required Final Acceptance Testing on complete system: Provide 48 hours notice to ENGINEER prior to test. Ensure all division valves are open prior to beginning of test. Subject the entire sewerage system to a vacuum of 24 inches mercury, and allow to stabilize for 15 minutes before proceeding with test. There shall be no loss greater than 1% of initial vacuum per hour over a four hour test period.

925.6.6 All daily testing and Final Acceptance Test shall be recorded on vacuum charts to be provided by the ENGINEER. These charts will not be considered valid unless witnessed by ENGINEER on test equipment at beginning and end of vacuum test period.

925.6.7 The ENGINEER will sign and date charts to verify witness of tests. This signature does not indicate acceptance of the system.

925.7 LINE FLUSHING

925.7.1 After acceptance testing, flush lines to remove debris and foreign materials that accumulated in the lines during construction.

925.7.1.1 Suggested procedure (This procedure requires the use of vacuum valves, coordination of installation by the OWNER is the responsibility of the CONTRACTOR):

925.7.1.1.1 Place system under vacuum to 24 inches mercury.

925.7.1.1.2 Add water to valve pits at extreme ends of system and cause vacuum valves to operate and draw water into piping system.

925.7.1.1.3 Utilize system vacuum to transport the water and debris to collection point. Continue procedure until water entering at collection point is free of contamination or debris. If vacuum station collection tank is used as collection point, monitor volume of liquid in tank and pump out as necessary by means other than system sewage pumps. After completion of flushing, clean collection tank of all collected debris.

925.7.1.1.4 Restore vacuum collection tank and collection system to permanent configuration and make ready to place into operation.

925.7.1.2 Alternate flushing procedures are subject to ENGINEER'S review and approval.

925.8 BREATHER TESTING

925.8.1 After entire breather assembly is complete from the above ground flexible extension to the interior of the valve vault or buffer chamber, it shall be pressure tested as follows:

925.8.1.1 Fabricate a test pipe using 3/4" PVC materials or approved equal; one end to be 3/4" male pipe thread, the opposite end to terminate with a 1/8" tubing connection.

925.8.1.2 Remove breather dome and install the test pipe in its place. Pressurize the breather assembly to a minimum 40" water gage as measured with a magnehelic gauge. The assembly shall remain at a constant pressure with no detectable leaks for a minimum of one minute in the presence of the on site inspector. A dated record of all testing of breather domes shall be maintained in a bound notebook, which shall be turned over to the ENGINEER upon completion of all work.

925.9 MEASUREMENT AND PAYMENT

925.9.1 SANITARY SEWER FORCE MAIN WITH BEDDING

925.9.1.1 Measurement shall be per linear foot measured horizontally along the centerline of pipeline and fittings from the collection/lift station interface to the point of discharge as shown on the construction drawings. No deduction from the total will be made for intermittent installations such as division valves, pig launchers, and associated manholes.

925.9.1.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material; restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; air and hydrostatic pressure testing; and all other labor, material, and equipment incidental thereto.

925.9.2 SANITARY SEWER FORCE MAIN PIG LAUNCHER

925.9.2.1 Measurement of installed pig launcher shall be per each unit installed as shown on the standard drawing.

925.9.2.2 Payment for the pig launchers will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all fittings, flanges, restraining glands, and harnesses; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; furnishing and installing resilient seat gate valves; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.3 BORE AND JACK, CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN

925.9.3.1 Measurement shall be per linear foot, measured horizontally along the centerline of the encasement pipe actually installed for the work accomplished as shown on the standard drawing and on the drawings.

925.9.3.2 Payment will be in accordance with the unit price per linear foot as defined in the Bid Proposal, and shall include: trenching, unclassified excavation, backfilling, and compaction; furnishing and installing bored steel casing, casing insulators, and casing end seals; repair and replacement of existing roadway, bridge abutments, utilities, or any other structures damaged during boring and jacking operations; removal and disposal of waste material; providing grout for backfilling; inspections or permits; and all other labor, material, and equipment incidental thereto; except that the carrier pipe will be paid for under the appropriate bid item for vacuum main or force main.

925.9.4 SANITARY SEWER AIR RELEASE VALVE

925.9.4.1 Measurement shall be per each air release valve installed as shown on the drawings and the standard drawings.

925.9.4.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing air release valve with all necessary fittings and appurtenances; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.5 VACUUM SEWER DIVISION VALVES AND VAULT

925.9.5.1 Measurement shall be per each vacuum sewer division valves and vault installed as shown on the drawings and the standard drawing.

925.9.5.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing resilient seat gate valve with all necessary fittings and appurtenances; furnishing the OWNER with one five sided extension socket with 6-foot long T-handle extension bar for every five valves installed; furnishing and installing the gage tap assembly consisting of rubber tubing, fittings, supports, tapping saddle, and all other appurtenances for measuring vacuum in vacuum main; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and

compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.6 VACUUM SEWER BUFFER TANK

925.9.6.1 Measurement shall be per each installed buffer tank (single or double per the respective bid item) as shown on the drawings and the standard drawings.

925.9.6.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment, including pipe and breather connections, breather vent piping and flexible breather pipe assembly; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing all fittings, pipe, and all appurtenances; connection of the new or existing sanitary sewer gravity lines including drilling precast manhole sections, gaskets, sealants, and grout; furnishing and installing concrete grout for shelf; air and vacuum testing as required; and all other labor, material, and equipment incidental thereto.

925.9.7 INSTALLING VACUUM VALVE PIT

925.9.7.1 Measurement shall be per each vacuum pit (standard or deep, Type A or Type B per the respective bid item) installed as shown on the drawings and the standard drawings.

925.9.7.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment including unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions including fencing, landscaping, and all other obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings and concrete anti-flotation collar; installation of flexible breather pipe assembly and all appurtenances; stubouts for connection of gravity and vacuum lines; air, vacuum, and all other testing as required; and all other labor, material, and equipment incidental thereto.

925.9.8 VACUUM COLLECTION LINES AND VACUUM SERVICE LATERALS

925.9.8.1 Measurement of vacuum collection lines and vacuum service laterals shall be per linear foot measured horizontally along the centerline of pipeline

as shown on the drawings.

925.9.8.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; field quality control testing including daily vacuum testing of lines using OWNER furnished trailer mounted vacuum pump, breather testing, and all other testing required; making all required submittals; and all other labor, material, and equipment incidental thereto.

925.9.9 VACUUM VALVES AND APPURTENANCES: Measured and paid for per each as a separate pay item as included in the associated Vacuum Pit or Buffer Tank as specified and provided in the Bid Proposal.

SECTION 2100

STANDARD DETAILS FOR SEWER

DWG. NO.	TITLE
2101	MANHOLE TYPE "C"
2102	MANHOLE TYPE "E"
2107	CONCRETE MANHOLE COVER TYPE "C"
2110	MANHOLE FRAME AND COVERS
2111	MANHOLE ADJUSTMENT RING
2116	VERTICAL DROP AT MANHOLE
2117	VERTICAL CURVILINEAR SEWER AT MANHOLE
2118	SERVICE LINE CONNECTIONS AT MANHOLE
2125	SERVICE LINE DETAILS
2134	SEWER SERVICE REPLACEMENT DETAIL
2135	RISER DETAILS RIGID PIPE MAIN
2136	RISER DETAILS FLEXIBLE PIPE MAIN
2140	ENCASEMENT DETAILS
2145	SEWER LINE DEAD-END MARKER
2150	SAMPLING AND METERING MH, 6' X 8' RECTANGULAR
2151	SAMPLING AND METERING MANHOLE, 8' DIAMETER
2160	SANITARY SEWER AIR RELEASE VALVE DETAIL
2162	VACUUM SEWER STANDARDS - STANDARD DETAILS
2163	VACUUM SEWER STANDARDS VALVE AND PIT INSTALLATION WITH LIFT IN VACUUM SERVICE LATERAL
2164	VACUUM SEWER STANDARDS TYPICAL VACUUM BRANCH LINE CONNECTION
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APPENDIX C

SANTA FE COUNTY ORDINANCE 2003-01

**SANTA FE COUNTY
ORDINANCE 2003- 01**

2316057

(REPLACING SANTA FE COUNTY ORDINANCE NO. 1994-2)

**AN ORDINANCE REGULATING PROCEDURES FOR
WORKING IN, DISTURBING AND REPAIRING COUNTY PROPERTY AND
RIGHTS OF WAY**

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF SANTA
FE, NEW MEXICO:

Section 1. Short Title

This Ordinance may be referred to as the Right of Way Use Ordinance.

Section 2. Purpose

The purpose of this Ordinance is to establish and define responsibilities and standards for the use of public property and rights of way, especially regarding road use, excavations and restorations thereof.

Section 3. Index

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Section 2.	PURPOSE
Section 3.	INDEX
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Section 5.	PERMIT
Section 6.	EXCAVATIONS, ROAD CUTS AND BORING
Section 7.	RESTORATION OF ROAD CUTS
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Section 15.	NON-COMPLIANCE BY PERMITTEE
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Section 4. Definitions

- A. "Applicant" means any person required by this Ordinance to apply for a permit to make a road cut.
- B. "Boring," means the act of tunneling under the surface of the roadway or Right of Way.
- C. "Business day" means Monday through Friday.
- D. "Cultural Property" means a property as defined in the NM Cultural Properties Act 18-6-1 to 18-6-7 i.e., a structure, place, site or object having historic, archaeological, scientific, architectural or other significance.
- E. "County" means the County of Santa Fe, New Mexico as represented by its Board of County Commissioners.
- F. "County facilities project" means any road cut undertaken as a part of a project initiated by the County and includes related action taken by the utility company to further the County facilities project.
- G. "Emergency" means any situation or condition existing in which there is an interruption or disruption of gas, electricity, sewer, storm sewer, drainage structures, water, or telecommunications service to one or more customers being served by a utility company, or any situation or condition in which there is a danger of serious bodily injury, serious property damage, or prolonged disruption of service.
- H. "Excavation" means the act of making a hole, trench, or ditch, which penetrates through or under the surface in a public right of way or other public property, resulting in the removal of dirt, asphalt, concrete or other material.
- I. "Facilities" are and include, but are not limited to, plants, works, systems, improvements and equipment of the utility company such as pipes, electric substations, mains, conduits, transformers, wires, cables, poles, underground links, meters and concrete pedestals for any of the above and including postal service mail boxes.
- J. "Permit," means the written form provided by the County in which a person describes the use, excavation or road cut which will be performed on public property and in which are contained any special conditions required of the person by the County in the execution of the work. Permits are subject to the conditions and requirements contained in this Ordinance.
- K. "Permittee" means a person that has received a road cut permit from the County.

L. "Person" means any individual, estate, trust, receiver, cooperative association, club, corporation, utility company, firm, partnership, joint venture, syndicate or other entity.

M. "Public facility" means any designed, engineered, constructed road structures or engineered drainage facilities owned or maintained by the County located on public right of ways.

N. "Public right of way" or "public property" means those properties or sites within the County for which the County possesses a real property estate or interest, such as fee simple title, prescriptive easement or dedicated easement, and includes easements, right of ways, highways or roads, paved or unpaved, curbs, gutters, sidewalks, or other paved, unpaved, un-surfaced or concrete property which the County owns or maintains.

O. "Public Works Director" means the person employed by the County who is designated by the Board of County Commissioners to hold this position, and/or his designee.

P. "Road use" means any activity in or adjacent to the roadway that affects traffic and pedestrian flow.

Q. "Road cut" means the act of cutting a hole, trench, ditch or tunnel in, on, under, or through the surface of a public facility; or the act of drilling, boring, tunneling under or jacking up the surface of a public right of way.

R. "TCP" means a Traffic Control Plan or diagram showing the county how safe maintenance of traffic and Pedestrian flow will be conducted.

S. "Utility company" means any person, entity, or corporation, which provides water, sewer, electric, gas, telephone, or cable television services to five (5) or more hookups in the County. It also includes an independent contractor that has entered into a contract with the utility company to perform the road cut or excavation when the independent contractor is performing services for the utility company. Such an independent contractor must file a notarized affidavit with the County, executed by the utility company, setting forth the name, business address, and business telephone number of the independent contractor as an authorized agent of the utility company.

Section 5. Permit

A. Permit Application.

1. Every person desiring to make a road cut, bore or utilize Public right of way is required to obtain a permit. The applicant must be licensed and bonded, or the applicant must be a utility company or an agent for the utility company. In extenuating

circumstances where the applicant is a private party or not licensed, bonded or a utility company the applicant shall be required to comply with guidelines established by the Public Works Department. The person shall make written application on forms provided and approved by the Public Works Director prior to the performance of any road cut work or activity on public property. County staff has 5 days to review and process submitted applications.

2. No person shall make any road cut on public property or utilize Public right of way until the person or designated agent obtains an appropriate permit from the County, except in an emergency. In the event of an emergency, the person may proceed with such activity immediately but notify the County by phone that such an emergency is being repaired and thereafter file an application within two (2) business days. The application must state the description of the emergency and a summary of the repairs. The applicant must comply with any reasonable repair directions set forth by the County.

3. The applicant shall agree to the following; (a) complete all work required by this ordinance, covered by the permit; (b) complete any specific item required by the County in conjunction with the permit within five (5) days after written notice is given by the County to do so. The Public Works Department is authorized to grant an extension if necessary.

4. Evidence shall be presented that insurance requirements have been met in accordance with section 8, except for governmental agencies.

5. Evidence shall be presented that any "tie in" or "extension of utilities", is authorized by the applicable utility company, utility association or provider of services.

B. Faxing permit applications, Billing.

A utility company may file its application for a road cut, right of way use permit and all supporting information through the use of telecopy machine located in the County Public Works Office, in accordance with procedures established by the Public Works Director. An approved permit may be sent to the applicant in accordance with similar procedures. The Public Works Director, in his discretion, may allow a person to be billed for fees due and payable under the terms of this Ordinance on a monthly basis, provided the person is not more than sixty (60) days delinquent in payments due under this Ordinance. No further permits will be issued if payments are more than 60 days delinquent

C. Permit Fees.

The permit fees are set forth in Section 10.

D. Length of Road Cut; Number of Road Cuts, Use of Right of Way

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By issuance of a road cut permit, the County authorizes the cutting or excavation of a road or right of way by approved methods as listed in the New Mexico Standard Specifications for Public Works Construction and only for the single road cut specified on the permit. When the project involves the excavation of the road or right of way in a manner that runs roughly parallel to the roadway, the permit shall authorize up to six hundred (600) lineal feet of excavation.

Section 6. Excavations, Road Cuts Or Boring.

A. Purpose: It is the primary purpose of this ordinance to achieve maximum public use of public right-of-way, consistent with the laws of New Mexico and to insure that utility relocations on or in County rights of way are accomplished in accordance with New Mexico Statutes, Regulations and Federal Codes while providing for maximum public safety, maintenance of the roadways, and minimizing future conflicts between the County roadways, highway systems of New Mexico and utilities serving the general public in the County of Santa Fe.

B. Preferred means: In all circumstances, best efforts shall be made to install utility facilities using existing overhead facilities or bore under the roadway instead of excavating in an attempt to limit patches on the road surface. Road cuts shall be the least desirable means of utility facility installation.

C. Clearance of Vital Structures: Work under these provisions must be performed and conducted so as not to interfere with access to fire hydrants, fire stations, fire escapes, bridges, traffic control devices, and all other vital permanent structures or equipment.

D. General utility design requirements: Except when a higher degree of protection is required by industry or governmental codes, laws, or orders of the public authority having jurisdiction over the utility, all utility facility installations on, over, along or under the surface of the rights-of-way of County roadways, including attachments to highway structures shall, as a minimum, meet the following utility industry and governmental requirements:

(1) Electric power and communication facilities installations shall conform to the current applicable National Electric Safety Code.

(2) Water, sewage and other effluent lines shall conform to the requirements of the American Public Works Association, the American Water Works Association and County Standards.

(3) Pressure pipelines shall conform to the current applicable sections of the standard code of pressure piping of the American National Standards Institute, 49 CFR section 192, 193 and 195, and/or applicable industry codes.

(4) Liquid petroleum pipelines shall conform to the current applicable recommended practice of the American Petroleum Institute for pipeline crossings under railroads and highways.

(5) Any pipeline carrying hazardous commodities shall conform to the rules and regulations of the U.S. Department of Transportation governing the transmission of such materials. Pipelines located in casings, galleries, utility tunnels or highway structures shall be designed to withstand expected internal pressures, and to resist internal and external corrosion; casings or uncased pipelines shall be designed to withstand external pressures as well. Joints in carrier pipelines operating under pressure shall be of a mechanical or welded leak-proof construction. Ground-mounted utility facilities shall be of a design that minimizes, to the extent practicable, the impact on the scenic quality of the specific highway segment being traversed and or of a design approved by the Public Works Department. All utility installations on, over, along or under roadway rights-of-way, and attachments to roadway structures, shall be of durable materials, designed for a long service-life and relatively free from routine maintenance. On new installations or relocation of existing facilities, provisions shall be made for expansion of the facilities, particularly those underground or attached to highway structures. These provisions shall be planned so as to avoid interference with highway traffic when additional facilities are installed in the future.

(6) The facility owner shall be responsible for compliance with industry codes, the conditions and/or special provisions specified in the permit, applicable statutes and regulations of the State of New Mexico, and the U.S. Department of Transportation Code of Federal Regulations.

(7) The utility company shall be responsible for the design, construction, and maintenance of all facilities to be installed within Santa Fe County or public right of way. All elements of these facilities are subject to review and approval by the County Public Works Department, particularly the materials, location, and method of installation. The utility is responsible for, and will provide all measures as required to preserve the safe and free flow of traffic and the structural integrity of the roadway, roadway structures, ease of roadway maintenance and appearance of the roadway resulting from their installation. Prior to any utility work within the County or public right of way, The County Public Works Department shall approve all submitted traffic control plans.

E. Maintenance of Traffic and Pedestrian Flow.

The permittee shall maintain safe and adequate passage of vehicle and pedestrian traffic on all public property on which the permittee is conducting its activities under its permit. When a public facility has been closed or detoured because of the permittee's work, The Santa Fe County Public Works Department shall be notified by the permittee prior to removal of existing barricades and other traffic control devices.

F. Permittee's Obligation to Protect Property.

It is the permittee's responsibility to verify no known cultural properties exist in the permit area. Should known cultural properties occur in a permit area, a permit shall not be issued until the applicant submits notification from the State Historic Preservation Division certifying that said properties have received sufficient consideration. Should unknown cultural properties be encountered during work conducted under a permit, work in the immediate vicinity of the cultural property shall cease and the County shall be notified.

G. Restoration and Repair.

The permittee shall take whatever measures necessary to protect the road surface from damage by equipment used in the excavation process. Any damage to the road surface such as tearing or scaring of the pavement caused by the permittee's equipment shall be repaired to County requirements by the permittee. Traffic markings removed, as a part of the road cut shall be replaced by the permittee with materials similar to those originally displaced, in a place and in a manner satisfactory to the County. The permittee shall, at his own expense, support and protect all utilities which may be in any way affected by the road cut or other permitted work and do everything necessary to support, sustain and protect them under, over, along or across said work. Before commencing a road cut, the permittee shall ascertain the location of all utilities by notifying the New Mexico One Call System in or near the area of the proposed cut. The conformation number from the One Call System shall be listed on the permit prior to issuance of the permit. In the event said utilities are damaged, including damage to pipe coating or other encasement devices, the permittee shall immediately notify the facility owner of the damage. The permittee shall be liable for all costs associated with the damage and repair if the permittee was negligent and the facilities were properly marked and located. The permittee shall protect the road cut from surface water flows by appropriate diversions or ponding devices. The permittee shall repair asphalt or other road surfaces and other public facilities and public property to reasonable construction and engineering standards in order to approximate the condition that existed before the work.

H. Protection of Adjoining Property.

The permittee shall at all times and at his own expense preserve and protect from injury all private property adjoining the public property on which the road cut work is being performed by taking suitable measures for that purpose. Where in the protection of such property, it is necessary to enter upon private property for the purposes of taking appropriate protection measures, the permittee, shall unless otherwise provided by law, obtain appropriate permission from the owner of such private property to enter thereupon. The permittee must at his own expense shore up and protect all structures, facilities, walls, fences or other property that may be affected or damaged during the progress of the

road cut work and be responsible for all damages on other property resulting from his failure to properly protect and carry out such work.

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I. Care of Excavated Material.

All materials excavated and piled adjacent to the road cut or in any public place by the permittee must be piled and maintained so as to not endanger the public and those working in the excavation, and so as to cause as little inconvenience as possible to those persons using the public property and adjoining property. All material excavated must be laid completely along the side of the cut and kept trimmed so as to cause as little inconvenience as is reasonably possible to vehicle and pedestrian traffic. In order to expedite flow of traffic and to keep dirt and dust from spreading or flying, the permittee shall use guards or other methods and/ or shall water the excavated material.

J. Cleanup.

Each permittee shall thoroughly clean up from the public place all rubbish, excess earth, rock, asphalt, concrete, tree branches or limbs and other debris resulting from road cut work. All cleanup operations at the location of such road cuts are to be accomplished at the expense of the permittee. During the progress of work or immediately after completion of such work, the permittee shall clean up and remove all refuse, dirt and unused materials of any kind resulting from said work. Upon failure to do so, the County may cause to have such work done, and the permittee shall pay for such reasonable cost.

K. Protection of Water Course.

The permittee shall maintain all gutters, easement crossings and related drainage structures free-flowing and unobstructed for the full depth and width of the water course, or provide adequate substitutes for any such water course that are blocked by the road cut.

Section 7. Restoration Of Road Cuts.

A. Compaction.

Any person holding a road cut permit shall undertake to restore each road cut, in accordance with the reasonable compaction and restoration standards required by the County. This shall include both the backfilling of the road cut and the restoration of the surface. All backfill must be compacted to 95% density under the road surface, and 90% density outside the road surface. Certified nuclear density test results must be submitted to the Public Works Department within five (5) working days of completion of said work. Flow capacity and /or existing flow capacity shall not be altered without the written approval of the Public Works Director. For any person who does not submit compaction

test results to the County in a form and with results acceptable to the County, such person shall not be issued any future permits under this Ordinance until the person complies with this Ordinance, and the County may take such other actions as it deems necessary to assure compliance with this Section. The Public Works Director may waive the compaction tests for plow trenching only, provided the utility company demonstrates a method and operation of compaction acceptable to the Public Works Department.

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B. Resurfacing.

In those instances when a permittee cannot resurface a public place with concrete or asphalt because the air temperature or moisture content is below the minimum standards contained in the compaction and restoration standards or the weather conditions are such that the permittee is unable to resurface the public place within a reasonable time after the County's acceptance of any density tests, the permittee shall immediately check with Public Works Department concerning how and when the public facility shall be resurfaced. The County can require that the permittee cold patch the road cut on a temporary basis. The permittee shall restore the surface of the cut in accordance with reasonable compaction and restoration standards.

C. Cost.

The cost for restoration of the road surface shall be borne by the permittee.

D. County Performance.

If a permittee makes a road cut that is not resurfaced by the permittee within a reasonable time, and the County has not granted an extension of time, the County may, upon giving notice to the permittee, resurface the road cut and bill the permittee for the reasonable cost.

E. Safety.

It shall be the responsibility of the permittee restoring the public property to keep the road cut or surface opening safe for pedestrians, workers and vehicular traffic until the pavement surface or opening has been restored.

F. Extension of time.

Any time periods may be extended by the County due to weather conditions or other circumstances beyond the control of the permittee, with written or oral permission of the Public Works Director or his designee.

G. State Standards.

The permittee shall comply at all times with the appropriate construction standards set forth in New Mexico state statutes.

H. Restoration.

The permittee shall restore as practicably as possible, the affected property to the condition it was immediately prior to excavation or development. This includes but is not limited to depth of base course or other materials used on road surfaces. All materials shall be inspected and approved by the Public Works Department prior to use of any such materials. In the case of trenching in the right of way that exceeds six hundred (600) lineal feet the county recommends the responsible party document the condition of the surface by means of videotaping the proposed work area. The Public Works Department can require the seeding of disturbed areas to offset possible erosion that may result from the area being disturbed during excavation.

Section 8. Liability Insurance, Self Insurance and Bonding.

A. Certificate of Insurance.

No person other than a utility company shall make a road cut, enter a substructure opening, perform road cut work or utilize County right of way until filing with the County a certificate of insurance establishing that such person is adequately insured according to NM Tort Claims Act, NMSA 41-4-19, as amended against bodily injury or personal injury to any person, and against liability for damages, other than the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom. Each insurance certificate shall provide that the County be given at least thirty (30) calendar days notice of cancellation in writing by the insurance company.

B. Form and Type.

A utility company shall at all times maintain insurance or may self insure against all risks and perils set forth above for the reasonable limits of liability set by the NMSA 41-4-19 as amended and the County, in a form and type acceptable to the County, which approval will not be unreasonably withheld.

C. Performance bonding.

A performance bond in the amount of fifteen thousand dollars (\$15,000.00) shall be kept on file at Public Works along with the contractor's license and insurance documents.

Section 9. Location and Relocation Of Facilities

The County expressly reserves the right to change the grade, install, relocate, or widen the public right of ways within the County and subject to all regulatory approvals, the facility owner shall relocate, at its own expense, its facilities and appurtenances in order to accommodate the paving, installation, relocation, widening, or changing of the grade or location of any such public right of way, including if necessary, relocating facilities to a sufficient distance within the right of ways and to permit a reasonable work area for machinery and individuals engaged in such work, or to protect the health, safety, or welfare of the public.

Section 10. Fees.

A permit fee of seventy-five dollars (\$75.00) shall be charged and collected for each proposed activity and for each permit issued up to 600 lineal feet. The seventy-five dollar (\$75) fee collected shall be distributed as follows: Sixty seven percent (67%) shall be designated to the County General Fund and Thirty three percent (33%) shall be designated to a road maintenance fund for repair of roadways. For permits in excess of 600 lineal feet the fee will be prorated by dividing the length by 600, then multiplying it by seventy-five dollars (\$75). Except for the Public Works Department, which is not required to obtain a permit for any of its projects, all other County departments shall be required to obtain a permit.

Section 11. Road Cut Warranty.

Any person or facility owner including a utility company making a road cut shall be required to correct defective materials and workmanship performed under each road cut permit for a period of three (3) years from the date the work performed under such permit is completed.

Section 12. Routing of Traffic.

A. When road cut work or use of the right of way is being performed, the person making the road cut or using the right of way shall take appropriate measures to maintain traffic conditions as near normal as practicable at all times so as to cause as little inconvenience as possible to the occupants of the abutting properties and to the public. All applicants shall submit with the permit application a TCP or traffic control plan for approval by the Public Works Director or his designee along with the permit application. No permits shall be issued without the submission of a traffic control plan unless waived by the County.

B. The County may require the permittee to notify various public agencies, emergency services and the public of proposed work prior to issuance of a permit or prior to commencement of the proposed work if Public Works decides it is necessary for public safety.

C. Warning signs shall be placed by the permittee near each road cut or substructure opening being entered so as to give adequate warning to vehicular and pedestrian traffic both night and day, and cones or other approved devices shall be placed to channel traffic. The traffic controls, including but not limited to the number, type, size and location of the signs shall be done in accordance with Manual on Uniform Traffic Control Devices (MUTCD) Part VI and reasonable traffic standards as directed by the Public Works Director or his designee.

D. The County may require the permittee to place a visible sign at each end of the construction area which is visible from a distance and sets forth the name of the person making the road cut, or in the case of a utility company, the name of the company together with a business telephone number to handle calls from the motoring public.

Section 13. Noise, Debris and Working Hours.

Each permittee shall conduct and carry out road cut work in such manner as to avoid unnecessary inconvenience and annoyance to the public and occupants of neighborhood property and in compliance with the County noise standards.

Section 14. Preservation of Survey Monuments.

Any survey monument set for the purpose of locating or preserving the lines of the road, property, subdivision, or a permanent survey, or a permanent survey bench mark within the County shall not be removed or disturbed without first obtaining written permission from the owner. Permission to remove or disturb such monuments, reference points or bench marks will be granted only upon the condition that the person apply for such permission and pay all expenses incident to the proper replacement of the monument.

Section 15. Non-Compliance by Permittee.

In the event a permittee fails to comply with the requirements of this Ordinance, the Public Works Director or his designee shall notify the permittee of non-compliance and stop all work until the permittee is in compliance. Written or verbal notice of non-compliance shall be issued. Following a hearing on the matter, a fee of three hundred dollars (\$300.00) may be assessed for non-compliance of this ordinance if the Public Works Director decides it is justified. The Public Works Director, his designee, County Fire Department, or County Safety Officer is authorized and empowered to suspend, revoke or refuse to issue any permit or future permit issued to a permittee provided that a hearing on the matter be conducted by the Public Works Director within five (5) business days of the suspension, revocation or refusal to issue the permit unless based on failure to adequately complete an application. The permittee shall be granted one appeal to the Public Works Director following the decision if the permittee makes written request to do so. The County of Santa Fe reserves the right to issue or revoke any permit for any reason

deemed reasonable by the Public Works Director or his designee. The County may also deny issuance of a permit to any applicant if there are delinquent compaction test results from previously performed road cuts.

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Section 16. Amendment To Ordinance 1993-8.

Sections 7 A, 7 E, 7 F, 8 B, and 9 of Santa Fe County Ordinance 1993-8 are hereby Repealed.

Section 17. New Pavement Fee and Penalty.

Any person, facility owner or utility excavating or cutting into new pavement (less than two yrs old) shall be charged a fee of two hundred dollars (\$200.00) to offset the impact of cutting the new pavement, which frequently leads to failure of new roadways installed by the County.

Section 18. Saving Clause.


If any of the sections, subsections, sentences, clauses, or phrases, of this Ordinance are for any reason held to be unconstitutional or invalid, the validity of the remaining portions of this Ordinance shall not be hereby affected since it is the express intent of the County Commission to pass each section, phrase, paragraph and word separately.

Section 19. Effective Date.

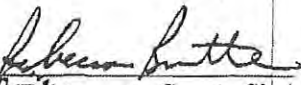
This ordinance shall take effect thirty days after the recording date.

SANTA FE COUNTY:

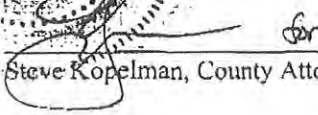
2316070


Paul D. Duran, Chairperson
Santa Fe County Board of Commissioners

ATTEST:


Rebecca Bustamante, County Clerk

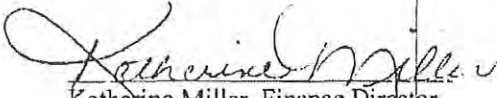
APPROVED AS TO LEGAL FORM:


Steve Kopelman, County Attorney

1-7-2003

Date

FINANCE DEPARTMENT APPROVAL:


Katherine Miller, Finance Director

1-8-03

Date



1244 037
COUNTY OF SANTA FE
STATE OF NEW MEXICO

I HEREBY CERTIFY THAT THIS INSTRUMENT WAS FILED
FOR RECORD ON THE 16 DAY OF JAN AD.
20 03 AT 11:07 O'CLOCK AM
AND WAS DULY RECORDED IN BOOK 2316
PAGE 057-070 OF THE RECORDS OF
SANTA FE COUNTY

WITNESS MY HAND AND SEAL OF OFFICE
REBECCA BUSTAMANTE
COUNTY CLERK, SANTA FE COUNTY, N.M.


DEPUTY

APPENDIX D
SANTA FE COUNTY WATER UTILITIES

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

**Water Utilities Division
Water and Sewer Construction Standards and Specifications**

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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

Section A General Provisions

A.1

Referenced Construction Specifications and Construction Drawings: The following specifications and drawings shall be included as a part of these specifications by this reference:

1. SFC Utilities Approved Standard Drawings and Notes.
2. American Water Standards Specifications (AWWA Specifications), latest published revision.
3. New Mexico Standard Specifications for Public Works Construction (NMAPWA Specifications) latest published revision.
4. New Mexico Department of Transportation Standards Specifications for road and bridge construction (NMDOT Specifications) latest published revision.
5. ASTM Standards
6. The following SFC Utilities Construction Specifications shall take precedence over referenced specifications in items #1 - #4 above.

A.2

Developer Construction: Developer installed public water distribution system improvements shall be done in accordance with the Water Service Agreement requirements. The developer and the developer's contractor are responsible for completing work in accordance with these specifications. The developer and the developers contractor shall be referred to herein as the Contractor for developer installed public water distribution systems. The term "Owner" as used in this document refers to the Developer.

A.2.1

Prior to final SFCU approval of the construction plans, a letter will be required from the Design Engineer indicating that they are providing the inspection and record drawing services for the project.

A.2.2

Prior to final acceptance for Operations and Maintenance of Public Water and Sewer infrastructure projects: Written certification in the form of a Certificate of Compliant Construction shall be provided to SFCU by the Design Engineer whose design supported the construction permit, certifying that that the constructed improvements have been properly inspected during construction and were installed in conformance with the original specifications or with approved written change orders. The construction of the water or sewer system improvements will be in compliance with the approved drawings and shall be observed and verified under the direction of an engineer registered in the State of New Mexico. This will include the submission of final record as-built drawings for the water and or sewer system in hard copy and pdf formats, all pressure test results, bacteria test results, and backfill compaction test results for review and approval by SFCU prior to final acceptance.

A.2.3

Construction shall be performed by a utility contractor properly licensed in New Mexico for water utilities installation, upon receiving all applicable construction permits, right of way use authorizations, and upon having met all applicable pre-construction requirements including a pre-construction meeting. A notice to proceed will be issued once all conditions have been met.



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A.2.4

The County will accept the project and adopt it as part of its infrastructure for operations and maintenance, upon verification that all requirements have been met to the County's satisfaction, and in compliance with the County-accepted engineering design, any pre-approved change orders, including the following:

- I. The water and or sewer system to be conveyed to the County shall be installed within a legally defined County Utility Easement; all easements that have been requested must be finalized and recorded prior to final acceptance of the project.
- II. The minimum warranty period upon completion of the project shall be one calendar year, commencing once the project has been accepted by the County Utilities Department.
- III. A final inspection by the Utilities Department Maintenance Division will also be required. Following this inspection, the contractor may have to perform additional work before the project is deemed complete. Punch lists will be generated as necessary.
- IV. Official completion of the water and wastewater utilities work shall be documented via a letter of acceptance issued by the County Utilities Department.

A.3

All construction work shall be monitored by SFC Utilities Supervising Engineer or designated representative for strict compliance with all applicable specifications, codes and standards. Contractor shall provide access to all water system facilities for inspection purposes and notify SFC Utilities Supervising Engineer prior to commencing work. Contractor shall notify SFC Utilities a minimum 24 hours in advance of work to be performed outside normal working hours.

Failure to provide access for inspection of work or to notify SFC Utilities of work to be performed after normal working hours shall result in said work being unacceptable to SFC Utilities until complete access and inspection is made. Contractor shall give the Supervising Engineer a minimum 24 hour advance notice of overtime work scheduled. SFC Utilities will provide overtime inspection as agreed by the supervising engineer in such instance where the overtime work is required for convenience or necessity of the public. Overtime inspection shall not be done solely for the Contractor's convenience.

Any overtime work shall be inspected by SFC Utilities on the following regular work day, in cases where SFC Utilities does not provide overtime inspection.

A.4

Interference with Service and Schedule of Work: Contractor shall be required to arrange his construction schedule with the intent of maintaining continuous service to SFC Utility users to the fullest extent possible from existing facilities. No outage shall exceed 4 hours unless coordinated directly with the SFC Utilities. Should a conflict between the contract work and service occur, Contractors shall as directed by the supervising engineer, discontinue the work.

Contractor shall have SFC Utility approval for any water shutoff and connections to existing mains prior to the scheduling of any construction. Contractor shall distribute shutoff notices to the general public as necessary. Contractor shall not operate an existing SFC Utilities valve or fire hydrant unless specifically authorized to do so and such operation shall be under the direction of SFC Utilities field personnel.

Contractor may be required to do work outside of normal working hours if SFC Utilities deems it necessary for the convenience of SFC Utility customers and the general public. When the Contractor is required to shutoff existing waterline to perform any wet connections, Contractor shall, as directed by SFC Utilities, notify each affected



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customer no less than 48 hours in advance of the anticipated service interruption. SFC Utilities will provide forms (need to create these "forms"??) detailing the information to be provided to affected customer. Also, Contractor and SFC Utilities shall determine when shutoff will be made so that a notice may be placed in the local newspaper by the Contractor. These actions shall be taken to give the water users ample time to arrange for a temporary supply of water.

A.5

Construction Water: Construction water shall be used in accordance with current County Water Ordinances. Contractor shall be required to pay for all potable and non-potable water used for construction purposes. If existing water of satisfactory quality for the construction needs can be found from other than the SFC Utilities source, Contractor may obtain his water from that source. SFCU does not issue hydrant meters.

A.6

Protection of Utilities and Property: During performance of the work, Contractor shall protect all utilities and property from damage. All utilities shall be spotted prior to any excavation work by Contractor. Contractor shall call New Mexico One Call (811) and request utilities location forty eight (48) hours prior to excavation in accordance with New Mexico One Call operating procedures.

The Contractor shall attempt to locate sewer laterals and other private service lines. Contractor shall contact property owners prior to construction and request location information. Any sewer or water laterals cut during excavation shall be repaired by Contractor at no additional cost to SFC Utilities. Payment for repairs of sewer and water services laterals shall be considered paid in the Construction price for water pipe in place.

A.7

Barricades and Signs: Any signs used by Contractor during performance of work shall conform to the Manual of Uniform Traffic Control Devices.

A.8

Work in Streets Right-of Way: All of Contractor's construction work in street rights of way shall be done in strict accordance with the applicable controlling public agency's construction specifications, rules, regulations and ordinances.

Contractor shall coordinate with proper public officials and receive approval from said officials prior to any street closing or detouring required due to the work to be performed. Permit costs are considered incidental and included as part of placing of pipe.

A.9

Maintenance of Traffic: Contractor shall maintain traffic flow(s) and accessibility to private property(s) as close to normal condition as possible. Contractor shall notify residents, city and state officials as appropriate of any driveway or road closure.

A.10

Environmental Issues: The Contractors obligation to obey environmental laws, EPA requirements in the latest Construction General Permit (CGP), Storm Water Pollution Prevention Plan (SWPPP) or standards is not limited by the following items.



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A.10.1 Protection of Vegetation: Contractor shall protect existing vegetation from removal or damage wherever possible. Contractor shall confine construction work to specified construction limits as shown on the drawing or defined in the specifications. Should Contractor damage or remove any vegetation outside the construction limits, Contractor shall restore the affected area to its original state at no expense to SFC Utilities or the Owner.

A.10.2 Re-vegetation of Disturbed Areas: Within the Santa Fe County boundary, contractor shall re-vegetate as required by the CGP and County ordinance(s).

A.10.3 Archaeological/Cultural Permits: Contractor shall not commence excavating within Santa Fe County without a permit issued by the Santa Fe County Land Use Department.

A.10.4 Slope Protection: Contractor shall comply with the conditions of Santa Fe County Terrain Management Ordinance where applicable.

A.10.5 Water Conservation: Contractor shall use reasonable efforts to conserve water during construction. Based on drought or other conditions, SFC Utilities may require Contractor to use effluent water, collect flushing water for reuse, or other water conservation construction methods.

A.10.6 Separation between Water and Sewer: Parallel water and sanitary sewer lines must be placed at least ten (10) feet apart horizontally, and the water line must be at a higher elevation than the sewer. If it is impossible to meet these criteria, the water and sewer will be placed in separate trenches at a horizontal separation approved by the SFC Utilities Supervising Engineer, and the water line shall be at least two (2) feet above the sewer. When water and sewer lines cross each other, the water line shall at least be two (2) feet above the sewer.

A.11
Soil Testing: Testing for soil compaction requirements, proctor analysis, and any other material testing shall be done by a testing lab with all material testing to be certified by a professional engineer registered in the State of New Mexico. Test locations and intervals shall be at the direction of SFC Utilities and shall be the contractor's responsibility to also comply with all testing necessary for all work done in public right-of-way per the controlling agency's requirements. At a minimum, one set of backfill density tests shall be performed for every 12" lift for each 200 linear feet of pipeline not located in a roadway. For pipelines and utilities in roadways the minimum testing shall be for each 100 linear feet. A copy of all testing shall be incidental to the pipe laying bid items.

A.12
Work in Railroad Right-of-Way: Contractor shall not work within railroad right-of way without a license issued by the railroad owning the right-of-way. All work done by the contractor shall comply with the requirements of the license.

A.13
All work within Santa Fe County Right of Way must adhere to all of the requirements as set forth in Santa Fe County Ordinance 2003-1, the Excavation/Restoration Ordinance.

A.13.1
Work in NMDOT Right-of-Way: All construction work in NMDOT Right-of-way shall be done in strict accordance with applicable NMDOT requirements as specified in the NMDOT Standard Specifications for Highway and Bridge



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Construction manual, 2007 edition and subsequent revisions, Railroad and Utility Unit. Traffic signs, warnings, and barricades, shall be provided by contractor and shall conform to NMDOT requirements. Work within NMDOT construction projects shall meet all applicable project specifications and requirements.

A.14

Restoration of Unpaved Driveways and Streets: Un-surfaced and gravel surfacing driveways and streets shall be left in the same or better condition as they existed prior to construction. Grading shall be done with the appropriate type of grading equipment. Payment for gravel surface replacement shall be limited to a maximum width of the trench width plus eight feet. Any necessary surface replacement and grading outside of the trench width plus eight feet shall be made by Contractor at no expense to SFC Utilities or the Owner. Easement areas shall be graded to match existing contours.

A.15

Certificate of Compliance: A Certificate of Compliance shall be furnished to SFC Utilities and the Owner by Contractor for all material that has specification requirements listed in the Contract or as directed by the Supervising Engineer. Certificate of compliance shall be signed and notarized by the material manufacturer stating that the material supplied for Work under the contract meets all required specifications.

A.16

Safety Standards: The contractor shall have a documented safety program and shall have a designated safety officer to provide surveillance for work performed on the SFC Utilities water or sewer systems. The contractor shall ensure that all subcontractors comply with the safety provisions. The contractor's safety program shall include all necessary training, personal protective equipment, and other safety equipment and procedures necessary for all types of work performed on the SFC Utilities water or sewer system.



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SECTION B INSTALLATION OF WATER MAINS AND SERVICES

B.1

General: Construction of public water mains for the SFC Utilities system will be in accordance with the New Mexico Standards Specifications for Public Works Construction published by the New Mexico Chapter of the American Public Works Association except as noted below. The SFC Utilities specifications take precedence over the APWA specification in the event of any conflict between the two documents. The DEVELOPER is responsible for obtaining a copy of the APWA specifications.

B.2

APWA Section 701 : Trenching, Excavation and Backfill: Section 701 of the APWA specifications will be used in the following exceptions:

Section 701.8: REMOVAL OF EXISTING PAVEMENT, SIDEWALK, AND DRIVEWAY: The CONTRACTOR is responsible for obtaining any required pavement, cutting permits. The Contractor must adhere to all requirements as set forth in Ordinance 2003-1, the Excavation/Restoration Ordinance for all work in SFC Right of Way.

Section 701.11.4: BLASTING: Replace this sentence: "Blasting shall be under the supervision of a person qualified and experienced in the use and handling of explosives." with: "Prior to any blasting, CONTRACTOR shall submit a Santa Fe County Blasting permit application to SFC Utilities and shall obtain any applicable Santa Fe County or City of Santa Fe Permits.

Section 701.13.3.4: Delete this Section and replace with: "The CONTRACTOR shall utilize acceptable native material in the embedment zone in conformance with these specifications. No additional compensation for importing a different material for the embedment zone will be allowed. The CONTRACTOR shall utilize acceptable native material in the compacted fill above the embedment zone in conformance with these specifications. Additional compensation for importing a different material for the compacted fill above the embedment zone will only be allowed if the native material is Class IV, Class V, or rock."

Section 701.14.1: Organic materials such as wood, roots, etc. Are also excluded from final backfill.

Section 701.14.2: Delete 90% and replace with 95%.

Section 701.15.4: Add the following to the end of this section: "For each lift of backfill, compaction tests will be taken as directed by SFC Utility. At a minimum, tests within road right of ways will be required 100 feet apart along pipe centerline at each 1 foot depth interval. At a minimum, tests not within road right of ways will be required 200 feet apart along pipe centerline at each 1 foot depth interval. Tests will be staggered horizontally from tests taken at lower lifts.

Section 701.17.3: Add the following to the end of this section: "No additional payment will be made for excavation or blasting beyond the specified limits of the trench configuration."

Section 701: Add this section: "Exploratory digging shall only be performed with written authorization from the SFC Utilities Supervising Engineer. Exploratory digging shall not be used for any type of work that is ordinarily a part of normal construction (i.e. locating existing utilities in advance of trenching and pipe laying, etc.)"



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Section 701: Add this section: "The Supervising Engineer must issue written approval authorizing the use of imported backfill outside the pipe embedment zone prior to use. The contractor shall submit Proctor Test analysis showing import material suitability prior to placement."

B.3

APWA Section 710 – Boring and Jacking: Section of the APWA specifications will be used with the following exceptions:

Section 710.3.1: Delete the last sentence in this section and replace with "The allowable tolerance as to grade and alignment of the installed casing shall not exceed 2 inches per hundred feet of casing length or as approved by SFC Utilities based on site conditions.

Section 710.3.2: Redwood skids are not acceptable. CONTRACTOR shall use prefabricated casing spacers shown on the Approved Materials List and install in accordance with SFC Utilities Standard Detail Drawings.

Carrier Pipe (Nominal Size)	Steel Casing Diameter and Wall Thickness
6"	14" Schedule 30
8"	16" Schedule 30
10"	18" Standard Class
12"	22" Standard Class
14"	26" Schedule 20
16"	28" Schedule 20
20"	30" 0.375" Wall
24"	36" 0.375" Wall
¾" – 2" Cu Tubing	4" Schedule 40 PVC
¾" – 2" Cu Tubing	4" Schedule 40 Steel

B.4

APWA Section 801 – Installation of Water Transmission, Collector and Distribution Lines:

Section 801 of the APWA specifications will be used with the following exceptions:

Section 801.2 Add the following references: AWWA C905, latest revision.

Section 801.3.1.2 Delete this section (US material preference)

Section 801.3.2.2 Delete this section and replace with the following: "CONTRACTOR shall install the pipe material shown on the SFC Utilities construction drawing".

Section 801.3.2.3 Delete the following sentence: "All pipe shall be of domestic manufacture and origin".

Section 801.3.4.8 CONTRACTOR will use the SFC Utilities valve card to meet the requirement of this section.

Section 801.3.7.1 National Standard Fire Hose Coupling Screw Threads shall be furnished. Also, normal bury depth for SFC Utilities is 4 ½ to 5 feet unless field conditions require a deeper bury.

Section 801.3.8.5 Add this section: "Repaint the fire hydrant bonnet with Wellborn Traffic Yellow, Sherwin Williams Utility Yellow, Rust-Oleum Safety Yellow, or SFC Utilities approved equivalent paint".

Section 801.3.8.6 All flushing hydrants, including standard fire hydrants and the 2-1/2" post type shall be painted with Wellborn Traffic Red, Sherwin Williams Safety Red, Rust-Oleum Safety Red, or SFCU approved equivalent paint.

Section 801.3.8.7 For reclaimed water systems, unless specifically designed to provide adequate flows for fire protection, there shall be no standard fire hydrants installed. All yard hydrants or



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dispensing points connected to a reclaimed water/effluent irrigation system shall be painted purple. All such hydrants shall be lockable, and a prominent sign placed next to them with the following text: "Non-Potable Water do not drink/Peligro-Agua No Es Para beber"

- Section 801.3.8.10 Add this section: "Santa Fe County Fire Department shall apply fire hydrant number decals to match the fire hydrant number assigned on the SFC Utility construction drawing using decals provided by SFCFD."
- Section 801.3.9 PRESSURE REDUCING VALVE: Delete this section. PRV Valve requirements will be shown on the SFC Utilities construction drawing.
- Section 801.3.10 TAPPING SLEEVES: Tapping sleeves will be as shown in Section C, Approved Materials.
- Section 801.4 WATER VALVE DATA CARD: Delete the water valve data card shown in the APWA specifications and use the water valve data card attached to these specifications.
- Section 801.5 FIRE HYDRANT DATA CARD: Delete the fire hydrant data card shown in the APWA specifications and use the fire hydrant data card attached to these specifications.
- Section 801.7.1 Add the following to the end of this section: "See the SFC Utilities Standard Detail Drawings for storm drain and other pipe crossing requirements."
- Section 801.8.1 The minimum cover over SFC Utilities pipe shall be 4 feet or as shown in the SFC Utilities project drawing.
- Section 801.9.3 Add the following to the end of this section: "End(s) of the pipe(s) shall be covered at all times except during actual work on the pipe."
- Section 801.9.5 Add the following to the end of this section: "Changes in horizontal or vertical alignment from the drawings or field staking shall be made only when approved by the Supervising Engineer".
- Section 801.9.10 Add this section: An insulated 12 gauge solid copper wire shall be laid along with the pipe for the purpose of locating the pipe. This continuous conductor wire shall be laid with terminations at terminal boxes, valve boxes, fire hydrants, or meter cans as directed by the SFC Utilities representative.
- Section 801.10.3 Replace the first sentence of this section with: "Plastic pressure pipe shall be installed in accordance with applicable sections of AWWA M 23, C 900 and C 905 and manufacturer's printed recommendations."
- Section 801.12.1 Replace this section with the following: "The CONTACTOR shall use mechanical thrust restraint devised at fitting and pipe joints. Concrete thrust blocking shall not be used unless specifically authorized by SFC Utilities. Dry blocking shall be used only when authorized by Supervising Engineer. Dry blocking is to be used only for tie-in to existing pipe where service restoration time does not allow for the use of poured concrete and thrust restraints are not feasible.
- Concrete thrust blocking is to be placed in accordance with SFC Utilities Standard Detail Drawings. The concrete must have a minimum compressive strength of 3,000 psi. ($f'_c = 3,000$ psi) Compressive cylinder tests of concrete may be requested by the SFC Utilities representative and are included in the bid cost for thrust blocking. Fittings and bolts are to be covered with plastic prior to placement of concrete. Thrust blocking details for vertical bends will be provided by the SFC Utilities representative and will be based on site conditions.
- Mechanical thrust restraints must be placed in accordance with the manufacturer's recommendations and provide the restrained lengths shown on SFC Utilities Standard Detail Drawings. Mechanical thrust restraints must be used where restrained pipe is



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called out on the construction drawings. Full lengths of pipe shall be placed next to the fittings in order to reduce the need for harness restraints, where possible.

Section 801.14: FLUSHING AND DISINFECTING WATER LINES: Disinfecting water mains shall be done in strict accordance with AWWA Specifications C651, latest revision, except as herein specified. Flushing shall be done prior to chlorination in such a manner so that the water being flushed travels throughout the main length. If no fire hydrant is installed as part of the main, then the flushing shall be done through adjacent existing fire hydrant or through a tap at a no extra pay. The procedure for applying chlorine will be in strict accordance with Section 5.2.3 of AWWA C651, latest revision. A tap shall be made by Contractor at no extra pay for insertion of the chlorine. This tap shall be located where it can be used as a house service in the future if possible and shall be located by the Supervising Engineer. Chlorine shall be inserted at a rate not less than 25 mg/l ppm of free chlorine by weight for a period of 24 hours. A different equivalent time/amount ratio may be used at the Supervising Engineer's option but for a time less than 24 hours. Payment for disinfection and bacteria testing shall be considered as paid for by the fixed unit price on pipe.

Section 801.21.1.5: Add this section: "Receipts or other acceptable documentation showing that all supplier and subcontractor invoices have been paid."

Section 801.22: Delete this section (Measurement and Payment provisions as specified in the contract documents shall be used).

B.5

APWA Section 802 – Installation of Water Service Lines: Section 802 of the APWA specifications is replaced by this section, SFC Utilities Standard Detail Drawings, the SFC Utility Approved Materials List and the Measurement and Payment provisions of this specification.

B.5.1 Tapping Table: The Following table shall be used to determine pipe tapping requirements

TAPPING TABLE

Main Size & Type	Size of Taps where No Saddle is Required	Size of Taps Requiring Tapping Saddle	Size of Taps Requiring Tapping Sleeve
2" CI	None	¾" – 1 ½"	2"
4" & Larger CI	¾" & 1"	1 ½" – 2"	Larger than 2"
4" & Larger AC	None	Up to and Including 2"	Larger than 2"
4" & Larger DI	¾" & 1"	1 1/2 " – 2"	Larger than 2"
4" & Larger PVC	None	Up to and Including 2"	Larger than 2"



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SECTION C APPROVED MATERIALS LIST

C.1

General: All materials used in the construction of water lines shall be approved for use in drinking water systems. Materials shall be approved for use in drinking water systems by recognized organizations or governmental authority.

All underground service line valves and fittings shall conform to the requirements of ANSI/AWWA C800, latest revision. All underground valves and fittings shall be equipped with compression connections. The compression connection shall provide conductance and have a stainless steel or bronze internal split grip ring that grips the service tubing when tightened by the nut on the outlet threads. No clamps with screw type connections are acceptable. All service line valves, fittings and tubing shall be suitable for use with 150 psi pressure. Soldered joints for buried applications are not allowed.

All materials used in water mains and services shall be rated for a minimum of 150 psi working pressure.

The latest revision of standards shall apply with regard to standards listed in AWWA and American Society of Testing and Materials, (ASTM) Standards as well as any other referenced national or industry standards.

The type of pipe, size, joints, gaskets, coating, linings, wall thickness, installation, and testing shall conform to the latest revision of the specifications as set forth below.

C.2

Ductile Iron Pipe: Pipe shall conform to ANSI/AWWA C150/A21.5, latest revision, and ANSI/AWWA C151/A21.51, latest revision.

Mechanical joints, push on joints, or flanged joints shall be used as shown on all drawings and/or Standard Details. Joints shall conform to all requirements of ANSI/AWWA C115/A21.15, latest revision, and/or ANSI/AWWA C153/A21.53, latest revision, and or ANSI/AWWA C115/A21.15, latest revision. Rubber gaskets shall be bituminous coated on the outside.

Pipe thickness shown in AWWA C151.A21.51, latest revision, Table 51.2 for a rated working pressure, minimum of 150 psi shall be used, unless otherwise noted, or required for flanged pipe.

Installation and hydrostatic testing of the main shall be in strict accordance with ANSI/AWWA C600, latest revision. Disinfection of the main shall conform to C651, latest revision, requirements.

C.3

PVC Pipe: Pipe shall be manufactured and tested in strict accordance with ANSI/AWWA C900, latest revision, for 4-inch through 12-inch pipe or ANSI/AWWA C905, latest revision, for 14-inch through 36-inch pipe.

The thickness class shall be DR-18, unless otherwise noted. Pipe shall have the approval of NSF and shall be imprinted with the seal and approval of NSF.

PVC pipe shall be installed according to all applicable AWWA standards, and in strict accordance with the pipe manufacture's recommendations.



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C.4

Iron Fittings: Ductile or grey iron fittings shall conform to ANSI/AWWA C110/21/10, latest revision, or C153/A21.53, latest revision. Grey iron fittings shall be rated for 250 psi working pressure for sizes up to 3 inch. Ductile iron fittings shall be rated for a 350 psi working pressure in sizes 3-24 inch and ductile iron flanged fittings shall be rated for a 250 psi working pressure in sizes 3-24 inch.

Fittings shall be outside coated with a petroleum asphaltic coating, approximately 1 mil thick. Fittings shall be lined with cement mortar lining in accordance with ANSI/AWWA C104/A21.4, latest revision. Rubber gaskets shall be in accordance with ANSI/AWWA C111/A21.11, latest revision.

Installation of iron fittings be in strict accordance to AWWA/C600, latest revision, requirements.

C.5

Mechanical Joint Retainers: Shall be the Mega lug as manufactured by EBAA Iron, Inc., Eastland, Texas or the Uni-Flange as manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana.

For EBAA Iron, Inc. products the following shall be used: The series 2000 PV Mega lug shall be used for 4"-12" AWWA C900 PVC DR 18 pipe. The series 1100 PV Mega lug shall be used for and for 14"-30" AWWA C905 PVC pipe. The series 1100 Mega lug shall be used for Ductile Iron Pipe. Push on pipe joint harness devices shall be the series 1500 HV for AWWA C900 PVC, the series 1100 HV for AWWA C905 PVC, and series 1700 for Ductile Iron pipe.

For Ford Uni-Flang products shall be as follows: Series UFR1500-E-x-U shall be used for 4"-12" AWWA C900 PVC DR18 pipe. Series UFR1500-E-C shall be used for AWWA C905 14"-24" PVC pipe. Series UFR1400-D-x-U shall be used for Ductile Iron Pipe. Push on pipe joint harness devices shall be the series EFR1390-C-x-U for Ductile Iron pipe and AWWA C900 PVC.

C.6

Tapping Sleeves: Tapping sleeves (for taps other than size-on-size) shall have an epoxy lined and coated carbon steel A-36 body or an all stainless steel body; type 304 stainless steel bolts, hex nuts and plug; gasket suitable for water use; ANSI Class 150 flange. Tapping sleeves shall be manufactured by Romac Industries (Model 420 fabricated steel tapping sleeve), JCM (Model 412 fabricated steel tapping sleeve), Power seal (Model 3490 MJ stainless steel tapping sleeve with MJ outlet or AS stainless steel tapping sleeve with flange outlet), Ford (Model FTSC steel tapping sleeve or Model FTSS stainless steel tapping sleeve with stainless steel flange), or approved equal.

For size-on-size taps, a full wrap-around gasket and stainless steel full wrap-around tapping sleeve is required. The acceptable manufacturers are: Romac Industries (Model SST or Model SST-III stainless steel tapping sleeve), Power Seal (Model 3480 stainless steel tapping sleeve or Model 3490 MJ stainless steel tapping sleeve with MJ outlet or AS Stainless steel tapping sleeve with flange outlet), Ford (Model FTSS stainless steel tapping sleeve with stainless steel flange), or approved equal.

C.7

Gate Valves: Resilient seated gate valves shall be used wherever valves are called for on the drawings, unless otherwise noted. Resilient seated gate valves shall conform to AWWA C-509, latest edition, requirements; and shall be for 4" through 12" diameter N.R.S. (Non Rising Stem) A certified drawing shall be supplied by the manufacturer: The Manufacturer shall supply an affidavit of compliance to the above referenced AWWA



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specification. Records shall be provided showing that tests specified in Section 6 have been performed. Bolts and nuts shall conform to section 2.2.3 of AWWA C-509, latest edition.

Valve ends can be either flanged or mechanical and will be as specified at time of purchase. Valve shall come equipped with O ring seals. Valves shall open left (counter clockwise) as viewed from the top and valve markings shall be made as outlined in Paragraph 7.1 AWWA C-509, latest edition. Valves shall be furnished with interior coating in accordance with AWWA C550-90. 14" and 16" valves shall be of same specification or better and designed for 200 psi working pressure.

C.8

Butterfly Valves: Butterfly valves shall conform to AWWA C-504, latest edition. Valves furnished shall be equipped with a body style as specified on the drawings. Maximum non shock shutoff pressure shall be 150 psi and class 150B as defined in section 3.5 of C-504, latest edition. All affidavits of testing shall be furnished. CONTRACTOR shall verify the compatibility of the valve with pipe connecting pieces. Butterfly valves are to be used only in sizes 14" and larger or where specifically called for in the drawings.

Valve shaft seals shall be on the type utilizing a stuffing box and pull down pack gland. Valve body shall be ductile iron. Valve discs shall be of a noncorrosive alloy metal.

Valves furnished for buried service shall come equipped with a heavy duty valve operator.

Valves furnished for plant service shall be equipped with a geared actuator assembly with a hand wheel.

C.9

Valve Boxes: Valve boxes shall be five and one quarter inch (5 ¼") diameter shafts in 36 to 48 inch extension length to 69 inch extension lengths are required. Boxes shall have the screw-type length adjustment. Valve boxes shall be constructed of cast or ductile iron.

C.10

Fire Hydrants: Fire Hydrants shall be one of the following models:

Model	Manufacturer	Mfg Location
Kennedy Guardian	ITT Kennedy Valve	Elmira, New York
Mueller Super Centurion	Mueller Company	Decatur, Illinois
Mueller Super Centurion 250/HS	Mueller Company	Decatur, Illinois

C.11

Casing Spacers: Fabricated casing spacers for use on carrier pipe installation through casing conduits shall provide dielectric with polymer runners. Casing spacers with steel bands shall be coated with fusion bonded epoxy or PVC coatings for corrosion protection. Casing spacers shall be of the following models:

Model	Manufacturer	Mfg. Location
RACI Casing Spacers	Public Works Marketing Inc.,	Plano, TX



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C.12

Casing End Seals: Casing end seals shall be made of synthetic rubber and be either a pull or style or wrap around style. Stainless steel band clamps with 100% non metallic worm gear shall be furnished for clamping the seal to spacing and carrier pipes. A mastic seal strip shall be factory furnished along the edge of the wrap around style seal. Refer to Section E for the list of approved casing end seals.

Model	Manufacturer	Mfg. Location
Model Ac	Advance Products & Systems	Lafayette, Louisiana

C.13

Copper Service Pipe: Copper service pipe shall conform to ASTM B 88 and shall be Type K.

C.14

Water Service Materials: Water service materials manufacturers used in this section and referenced below:

Model	Manufacturer	Mfg. Location
Ford	The Ford Meter Box Co. Inc.,	Wabash, Indiana
Jones	James Jones Company	El Monte, California
DFW	DFW Plastics, Inc.	Bedford, Texas
Mueller	Mueller Company	Decatur, Illinois

C.15

Meter Boxes: Meter boxes shall be DFW Round Meter Pit as manufactured by DFW Plastics Inc., Mid-States Round Meter Pit, or SFC Utilities approved equivalent. The diameter and length shall be specified as set forth in the SFC Utilities Detail.

C.16

Meter Box Lids and Covers: Meter lids shall be made of plastic with the standard size pentagon bolt for the locking lid and shall be furnished with aluminum inner frost lids. Meter box covers shall be the following model and manufacturer for each size service as listed:

Meter Size	Cover Manufacturer & Model
¾" – 1"	Ford Meter Box Co. (FW3 Wabash Double Lid Cover with EXT-2 Extension Ring)
1-½" – 2"	Ford Meter Box Co. (MC-36-MB Monitor Cover – includes Inner Frost Lid)

Meter Box lids shall be the following model and manufacturer for each size service as listed:

Meter Size	Lid Manufacturer & Model
¾" – 1"	Nicor Inc. (Read Rite Lid Type "A"- H2O Load Rating)
¾" – 1"	Ford Meter Box Co. (WA3LP Locking Plastic Lid)
1-½" – 2"	Armorcast Products Co. (21-¾" Dia. Polymer Concrete Cover w. Worm Lock & Iron Recess)

Inner frost lids shall be the following model and manufacturer for each size service as listed:

Meter Size	Lid Manufacturer & Model
¾" – 1"	Ford Meter Box Co. (W3BA 11-½" Inner Aluminum Lid)
1-½" – 2"	Ford Meter Box Co. (MB 20" Inner Metal Lid)



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C.17

Meter Yokes: Yokes shall be constructed of cast iron. The meter yoke bar shall be painted. A 5/8" meter shall use 5/8" x 3/4" yoke; a 3/4" meter shall use 1" yokes, two (2) 1" x 3/4" meter adapters, and one (1) expansion connector, a 1" meter shall use 1" yoke and one (1) expansion connector. Yokes shall be the model and manufacturer as listed:

Manufacturer	Model for 5/8"	Model for 3/4"	Model for 1"
AY McDonald	14-2	14-4	14-4
Ford	Y 502	Y 504	Y 504
Jones	J 6201	J 6202	J 6202
Mueller	H-5020	H-5040	H-5040

C.18

Angle Valves: Angle valves shall be ball type compression connection for CTS tubing x locknut. (Locknut for yoke bar shall be used instead of a meter swivel.) Angle valves shall be the model and manufacturer as listed:

Manufacturer	Ball Style Model for 5/8"	Ball Style Model for 3/4" or 1"
AY McDonald	4602BYQ	4602BYQ
Jones	J-6417WSG	J-6417WSG
Ford	BA94-323 W-Q	BA94-444W-Q
Mueller	B-24273	B-24273

Include the following information for residential double meter services:

1. 5/8" Double Service Branch Piece
 - Acceptable Manufacturers: Jones (j-2613SG w/ dimensions of 1" x 7-1/2" x 3/4" MIP), Mueller (H-15363 1"x7-1/2" x 3/4" MIP) and Ford (U48-43-Q 1" x7- 1/2" x 3/4" MIP)
2. 5/8" Double Service Angle Valve
 - Acceptable Manufacturer: Mueller Co. Angle Ball Valve (B-24278 w/dimensions of 5/8" x 3/4" x 3/4" FIP) and Ford Angle Ball Yoke Valve (BA91-323W w/dimensions of 5/8" x 3/4" & 3/4" FIP).

C.19

Angle Cartridge with Dual Check Valve: Angle Cartridges shall be Dual Check Valve type. Angle Cartridges shall be the model and manufacturer listed:

Manufacturer	Model for 3/4"	Model for 1"	Model for 2"
Ford	HHCA92-323	HHCA92-444	HHFA31-777

C.20

Expansion Connectors: Expansion connectors shall be of the three piece design with composition gaskets. Plastic or rubber gaskets will not be accepted. Expansion connectors shall be the model and manufacturer as listed:

Manufacturer	Model for 5/8"	Model for 3/4"	Model for 1"
AY McDonald	14-2EHG		14-4 EHG
Ford	EC23	EC4*	EC4
Mueller	H-14234		H-14234



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*Two (2) Meter Adapters (Ford A24) also required.

C.21

Meter Settings, 1 -1/2" & 2": Prefabricated meter settings for 1 -1/2" & 2" meters shall be equipped with ball-type angle valves on the meter inlet and outlet sides and shall have a 24" rise and shall have FIP inlet and outlets and shall have a MIP by copper tubing compression adapter. Meter setter shall not have a bypass. Risers shall be positioned at least 2" away from the inner wall of the meter pit. Meter setting shall be the model and manufacturer as listed:

Manufacturer	Model for 1 ½" (Plug Valves)	Model for 2" (Plug Valves)
Ford	VV76-24-1166	VV77-24-1177
Jones	J02EFIPFIPBVBV24	J02FFIPFIPBVBV24
Mueller	H-1422-00-150	H-1422-00-200

Manufacturer	Model for 1 ½" (Ball Valves)	Model for 2" (Ball Valves)
AY McDonald	20-624WWFF 660	20-724WWFF 770

The adapter shall be the model and manufacturer as listed:

Manufacturer	Model for 1-1/2"	Model for 2"
Ford	C84-66	C84-77
Jones	J2605SG	J2605SG
Mueller	H-15428-150	H-15428-200

C.22

Corporation Stops: Corporation stops must be ball type with CC thread (AWWA tapered thread) inlet and compression connection on outlet (CTS – copper tube size). Iron pipe thread not acceptable. Corporation stops shall be the model and manufacturer as listed:

Manufacturer	Model Number
AY McDonald	4701BQ
Mueller	B-25008
Ford	FB1000-x-Q-K

C.23

Service Tapping Saddle: For PVC (C-900) installations: bronze parts are not acceptable. Service tapping saddle shall be stainless steel, double strap with iron body. The iron body shall have either epoxy coating (10-12 mills minimum) or nylon coating (10-12 mills minimum). Acceptable manufacturers are Smith-Blair, Ford and Mueller Co. Double band brass saddles with stainless steel bolts and band, style 202BS, as manufactured by Ford are also accepted.

For DIP/CIP installations: Direct tap with CC threads (AWWA tapered threads) is preferred. Iron pipe thread is not acceptable. Alternate exception is installation of stainless steel full circle tapped clamp with CC threads (AWWA tapered threads). All stainless steel to be: one section, two bolt minimum. Romac and JCM are acceptable manufacturers. Double band brass saddles with stainless steel bolts and band, style 202BSD, as manufactured by Ford are also accepted. When multiple taps are required the following spacing is approved: Minimum 12" horizontal spacing and vertical spacing shall alternate 75° and 85° from vertical.



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C.24

Service Tapped Couplings: Service tapped couplings shall have AWWA threads and shall be either cast iron, ductile iron or PVC and shall meet all requirements for fittings specified in Section C.

C.25

Prefabricated Meter Vault: Prefabricated meter vault shall consist of a vault body with open bottom, a double opening cover with a torsion lift and support mechanism. The vault body shall be manufactured of fiberglass-reinforced plastic. The covers shall be manufactured of polymer concrete. The torsion frame assembly shall be manufactured of hot-dipped galvanized steel. The cover shall be torsion assist polymer concrete consisting of two torsion assisted sides and a stationary center cover. The torsion assisted covers shall have the capability of opening 90 degrees and shall be secured in the closed position with hex-head bolt downs. The stationary center cover shall be secured with stainless steel hex-head bolts.

Polymer concrete covers shall be skid resistant with a 0.5 minimum coefficient of friction. Covers shall have lifting slots with stainless steel lifting pins. Vault body and cover assembly shall be designed to withstand 10,400 pound vertical load when installed at grade level. Vaults shall be manufactured by Armorcast Products Company, North Hollywood, California.

C.26

Air Release Valves: Air release valves shall be combination valves capable of releasing large quantities of air during filling of an empty pipe, and breaking vacuum during pipe draining by allowing the re-entry of large quantities of air, and releasing air accumulations under pipe operating pressure. The air release valves shall be Crispin Combination Air Valve (1" valve shall be Model 201C and 2" valve shall be Model 202C); or approved equal.

C.27

Utility Marking Posts: Utility marking post material shall be manufactured of fiberglass. The marking post shall be blue and have white labels on both sides with black lettering stating "CAUTION WATER PIPELINE/BEFORE DIGGING CLL NM ONE CALL 811 FOR LOCATES". Marking posts shall be constructed of resilient materials and shall not deteriorate with exposure to temperature extremes. Marking post colors shall not fade with exposure to sun, water, etc. Marking posts shall be 72" long by 4" wide. Acceptable manufacturers are Carsonite International. – Curv-Flex® (Early Branch, South Carolina) or Rhino-FiberCurve™ (Waseca, Minnesota).

C.28

All water mains and other pressure pipelines shall be buried with a continuous electrical tracing wire to enable future location of pipe. The tracing wire shall be an insulated #12 AWG solid conductor. Tracing wires shall be taped to the top of the pipe at 10-Foot intervals to prevent dislocation of the wire during backfilling. There shall be a Test Station for every 300 ft. run without a service or a hydrant.

The tracing wire shall be spliced and extended to an above or at grade Test Station near the base of fire hydrants, at valve boxes, and meter cans as directed by SFC Utilities representatives.

The Test Station shall be a 2-inch monitoring station as manufactured by Hadley Industries, Jackson, Michigan. The Test Station shall be furnished complete with a cast iron lid and a magnet for easy location with a line locator. A 12" by 12" by 4" deep concrete pad around the test box shall be provided for security.

The tracing wire shall be spliced using a 3-way low voltage tap connector, 3M-562 or equivalent. The splice shall be coated for corrosion protection using a general purpose tape sealant similar to Ray-Chem products, 1.5-inch



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wise, 0.012-inch thick spirally wrapping with 1-inch overlap at connector and wire. The tape sealant shall be covered with a layer of electrical tape as an outer wrap.

Bonding Wire for Line Tracing:

When the electrical continuity of two lengths of metal pipe is broken by a section of plastic pipe, the metal pipes at either end shall be bonded across the plastic pipe to restore the electrical continuity.

Bonding of the metal pipe shall be by means of cadwelds (exothermic) connectors and #4 AWG insulated copper wire. The wire ends and cadwelds shall be capped and sealed to prevent corrosion per Standard Details.

C.28.1

Electronic Marking System Devices (EMD's) Ball Markers are required on all sewer service (green) stub-out locations, casing bore ends or as required by SFCU, on all water line casing bore ends (blue), critical vertical offsets or as required by SFCU. Marker Balls shall be installed directly above the line being identified and in no circumstances shall the balls be buried deeper than 5-feet maximum. Acceptable materials are: 3M EMS Ball Markers; 1403-XR for water, 1404-XR for wastewater, and 1408-XR for reclaimed water systems.



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GENERAL NOTES

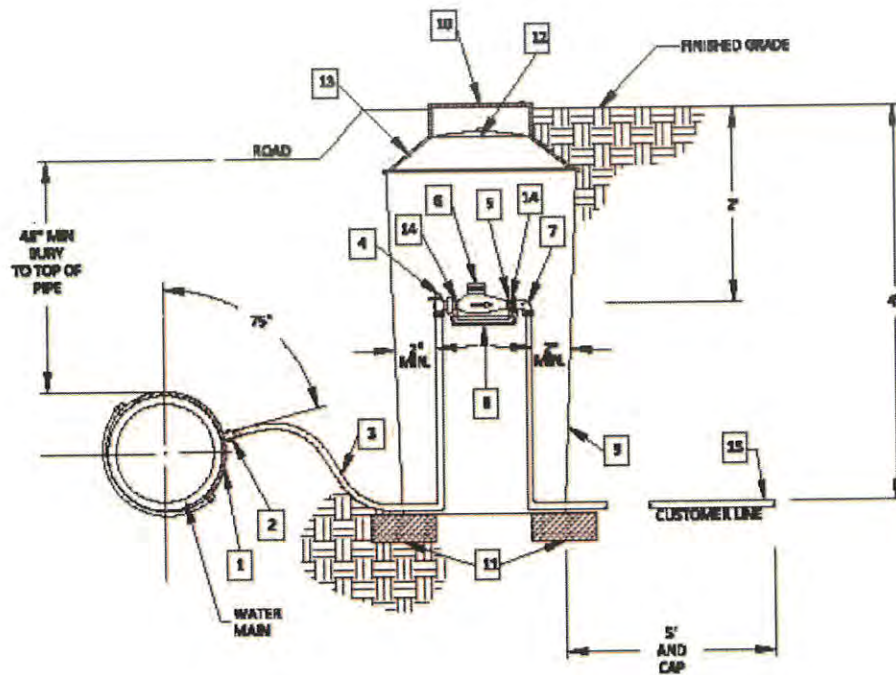
1. Contractor shall notify Santa Fe County (SFC) Utilities five (5) days prior to commencement of work.
2. Construction shall be done in accordance with the SFC Utilities construction standards and specification.
3. All easements shall be dedicated, cleared, graded and staked prior to water line installation.
4. All streets shall be cut to within $\pm 6"$ of final grade prior to water line installation.
5. Lot corners shall be staked prior to service line installation, curb, gutter and driveway aprons shall be installed prior to service line installation unless otherwise approved in writing by SFC Utilities.
6. Contractor (Developer) shall provide construction staking by a licensed New Mexico surveyor utilizing the appropriate Right-of Way maps, signed plats and SFC Utilities drawings.
7. Material submittals shall be approved by SFC Utilities prior to construction.
8. Contact New Mexico One Call at "811" two (2) working days in advance of construction for utility locates.
9. Pressure regulators shall be installed on all services downstream from the meter. Each residential service is required to install a pressure reducing valve (PRV), Watts #U5 or U5B in tandem with the meter or in its own vault box between the meter and the residence before any user service lines.
10. A minimum of 4 feet cover to top of pipe shall be maintained on all water mains and services.
11. Contractor shall submit as-built construction packet within five (5) days of completion of construction including: valve ties, as-built drawings, (including, but not limited to: fitting-to-fitting measurements, service-to-service measurements, center of main to center of service measurements, length of main installed, fittings installed, etc.) potability and pressure test results.
12. All valve boxes shall be brought up to grade after first course of asphalt and before final course of asphalt.
13. Fire hydrants shall be numbered using reflective numerals. The reflective numerals shall be applied by the Santa Fe County Fire Department at the completion of the project. Numbers shall be legible from the road. Prior to installing numbers, fire hydrant shall be painted per specifications on Page 7, Section B.4.
14. A mechanical restraint system shall be utilized on fittings and piping for thrust restraint. Concrete thrust blocking shall be used only for special conditions (E.G. Caps where main will be extended in the future) as specifically approved for SFC Utilities.
15. Any field changes to these plans require approval of both the design engineer and SFC Utilities.
16. Work on SFC Utilities facilities shall not begin until SFC Utilities has issued a NTP to the approved utility contractor.



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5/8" Single Service Detail	
Item	Item
1. 3/4" Service Saddle: See C.23	8. 3/4" Cast Iron Meter Yoke: See C.17
2. 3/4" Corporation Stop: See C.22 (AWWA Tapered Thread)	9. 20" Dia. X 36" Meter Box: See C.15
3. 3/4" Copper Tubing (Type "K"): See C.13	10. Polymer Lid (12-5/16" Dia.): See C.16
4. 3/4" Angle Valve: See C.18	11. Blocks – Use as Directed by SFC Utilities
5. 3/4" Expansion Connection: See C.20 (5/8" x 3/4" M.T.R. Conn)	12. Inner Aluminum Frost Lid: See C.16
6. 5/8" x 3/4" Neptune T-10 Water Meter w/ E- coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)	13. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening)
7. 3/4" Angle Cartridge w/ Dual Check Valve: See C.19	14. 3/4" Copper Tubing (Type "K"): See C.13

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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3/4" Single Service Detail

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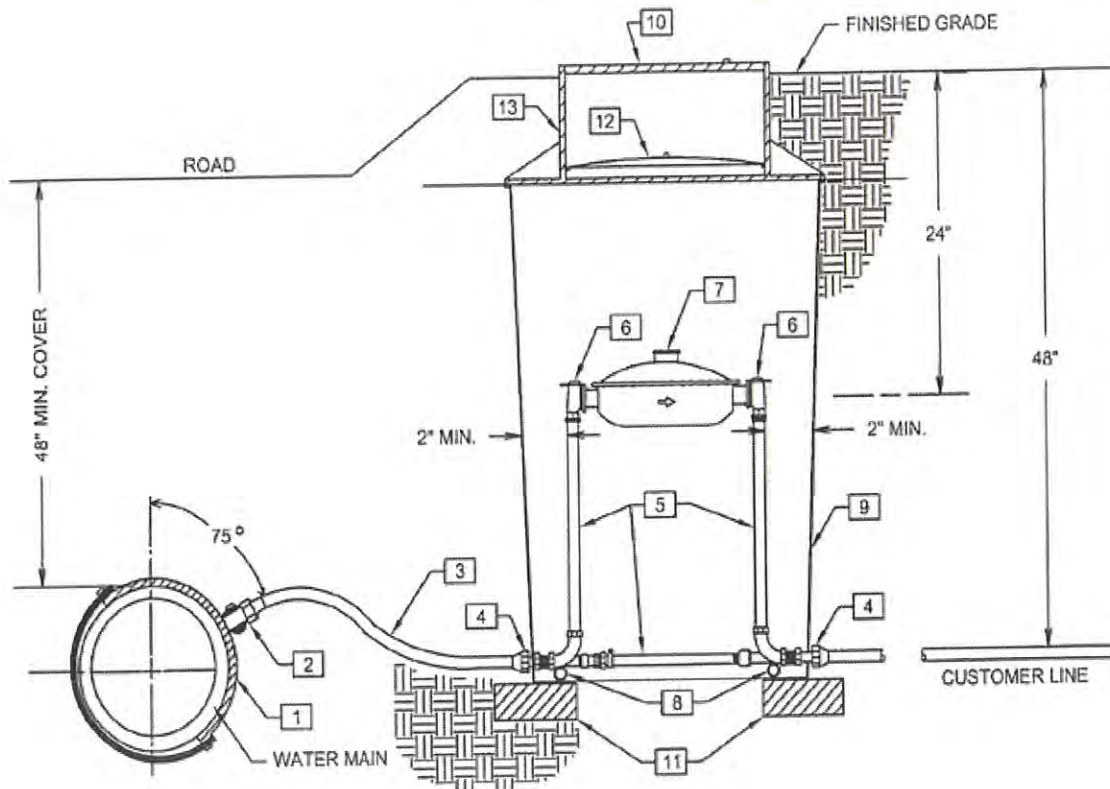
1" Single Service Detail	
<p><u>Item</u></p> <ol style="list-style-type: none"> 1. 1" Service Saddle: See C.23 2. 1" Corporation Stop: See C.22 (AWWA Tapered Thread) 3. 1" Copper Tubing (Type "K"): See C.13 4. 1" Angle Valve: See C.18 5. 1" Expansion Connection: See C.20 6. 1" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities) 7. 1" Angle Cartridge w/ Dual Check Valve: See C.19 	<p><u>Item</u></p> <ol style="list-style-type: none"> 8. 1" Cast Iron Meter Yoke: See C.17 9. 24" Dia. X 36" Meter Box: See C.15 10. Polymer Lid (12-5/16" Dia.): See C.16 11. Blocks – Use as Directed by SFC Utilities 12. Inner Aluminum Frost Lid: See C.16 13. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) with Extension Ring (20" Dia. 24" Dia.) 14. 1" Copper Tubing (Type "K"): See C.13

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



1-1/2" Single Service Detail

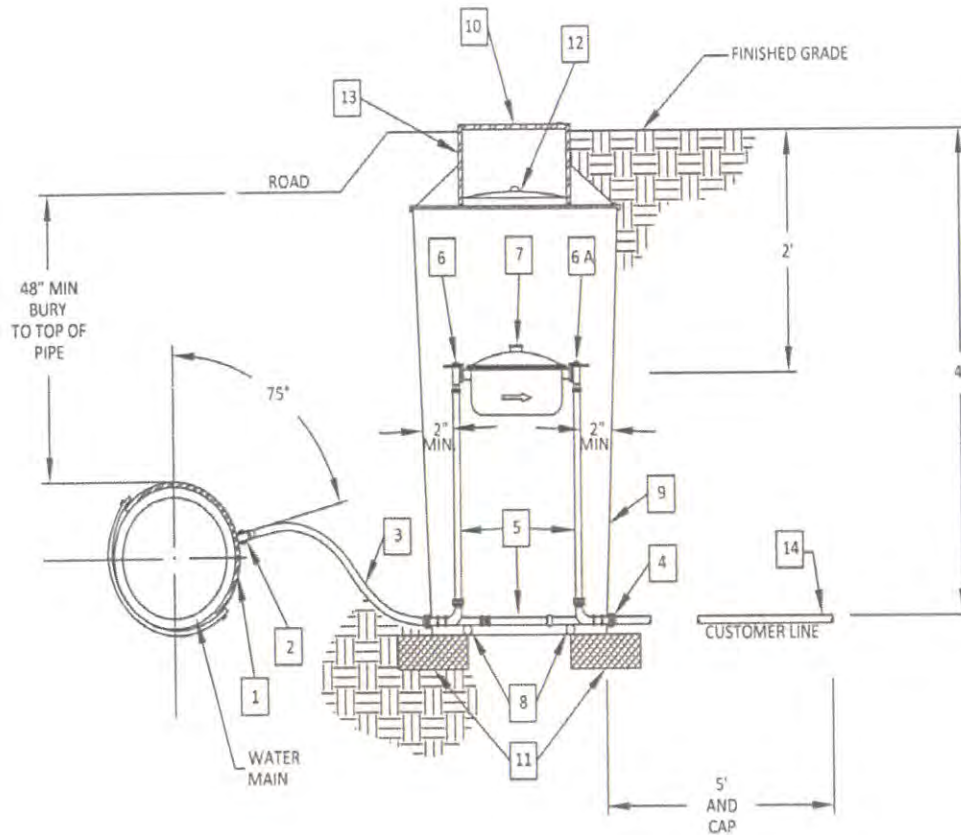
Item	Item
1. 1-1/2" Service Saddle: See C.23	7. 1-1/2" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
2. 1-1/2" Corporation Stop: See C.22 (AWWA Tapered Thread)	13" Flange-to-Flange Spacing
3. 1-1/2" Copper Tubing (Type "K"): See C.13	8. 1" Galvanized Pipe 24" Long
4. 1-1/2" Adapter Coupling	9. 36" Dia. X 36" Meter Box: See C.15
5. 1-1/2" Prefabricated Meter Setter (No By-Pass): See C-21	10. 20" Dia. Polymer Lid: See C.16
6. 1-1/2" Ball Angle Valve: See C.18	11. Blocks – Use as Directed by SFC Utilities
6A. 1-1/2" Angle Cartridge w/ Dual Check Valve: See C.19	12. Inner Metal Frost Lid: See C.16
NOTE: CHANGE DETAIL #6 (OUTLET SIDE) TO #6A	
	13. 36" Dia. X 20" Double Lid Cover: See C.16

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



2" Single Service Detail

Item

1. 2" Service Saddle: See C.23
2. 2" Corporation Stop: See C.22 (AWWA Tapered Thread)
3. 2" Copper Tubing (Type "K"): See C.13
4. 2" Adapter Coupling
5. 2" Prefabricated Meter Setter (No By-Pass): See C-21
6. 2" Ball Angle Valve: See C.18
- 6A. 2" Angle Cartridge w/ Dual Check Valve: See C.19

Item

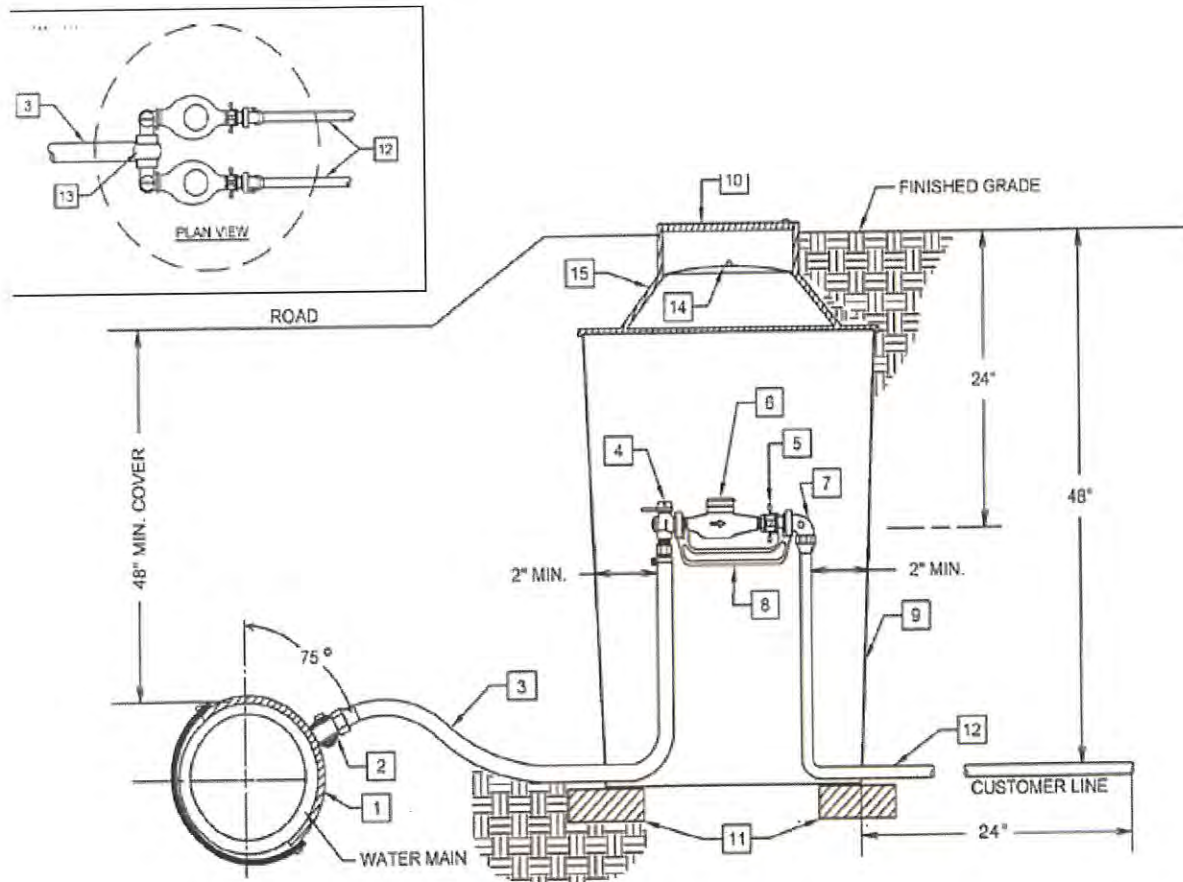
7. 2" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
8. 1" Galvanized Pipe 24" Long
9. 36" Dia. X 36" Meter Box: See C.15
10. 20" Dia. Polymer Lid: See C.16
11. Blocks – Use as Directed by SFC Utilities
12. Inner Metal Frost Lid: See C.16
13. 36" Dia. X 20" Double Lid Cover: See C.16



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NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



5/8" Double Service Detail

Item

1. 1" Service Saddle: See C.23
2. 1" Corporation Stop: See C.22 (AWWA Tapered Thread)
3. 1" Copper Tubing (Type "K"): See C.13
4. 3/4" Angle Valve (2 Each): See C.18
5. 3/4" Expansion Connection (5/8" x 3/4" M.T.R. Conn.) (2 Each): See C.20
6. 5/8" x 3/4" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
7. 3/4" Angle Cartridge w/ Dual Check Valve (2 Each): See C.19
8. 3/4" Cast Iron Meter Yoke (2 Each): See C.17

Item

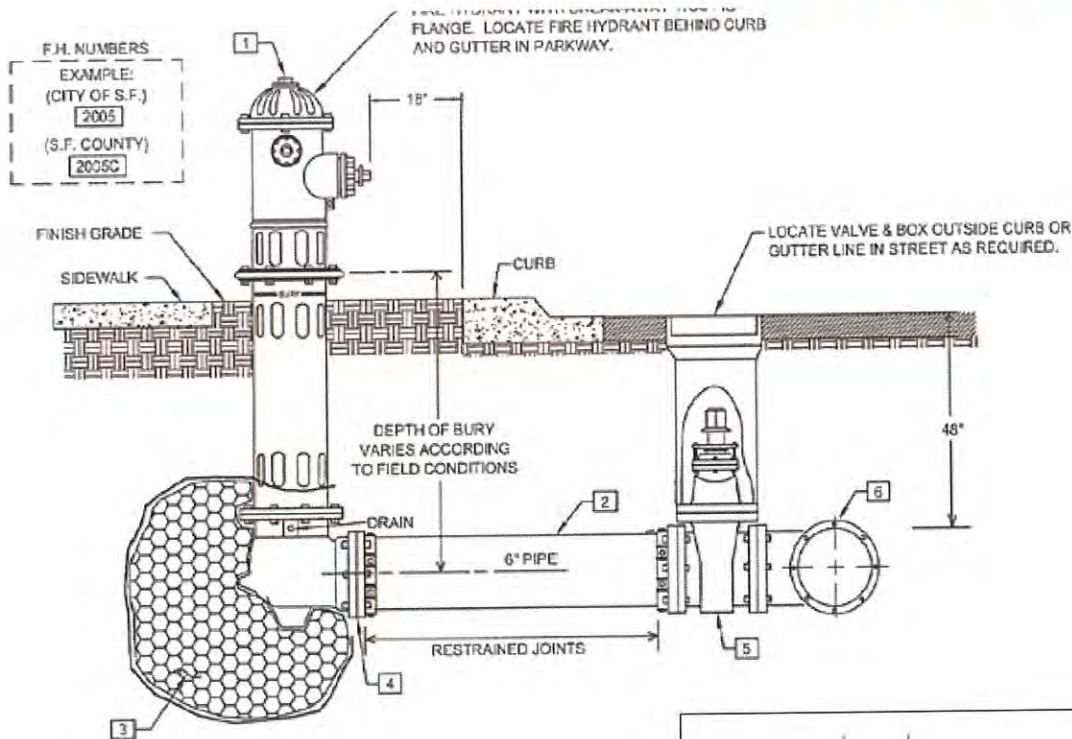
9. 24" Dia. X 36" Meter Box: See C.15
10. Polymer Lid (12-5/16" Dia.): See C.16
11. Blocks – Use as Directed by SFC Utilities
12. 3/4" Copper Tubing (Type "K") (2 Each): See C.13
13. Branch Piece: See C.18.1
14. Inner Aluminum Frost Lid: See C.16
15. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) with Extension Ring (20" Dia. 24" Dia.)

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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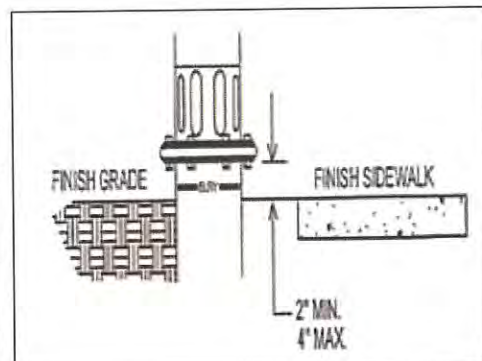
D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Fire Hydrant Detail

Item

1. Fire Hydrant
2. 6" Pipe
3. 1/2" Cubic Yard 3/8" Gravel Drain w/10 ml. Plastic Sheet
4. 6" MJ Retainer & 6" Harness (If Required)
5. 6" MJ x FL Gate Valve & Box
6. Tee: MJ Run w/6" Flange Outlet



Construction Notes

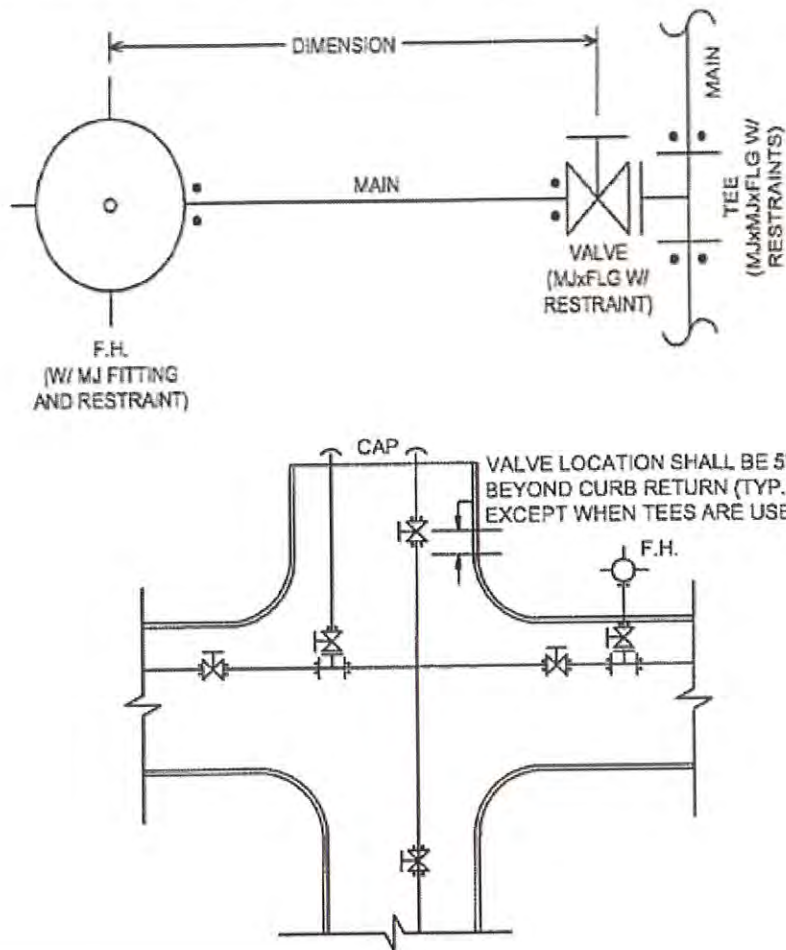
- A. Fire Hydrant shall not be installed near any structures and shall have a min. 36" clear space in all directions.
- B. Locate Hydrant 18" behind back of curb unless otherwise shown on plans or specifically directed by SFC Utilities. Hydrant to be set plumb and at proper elevation (elevation provided by developer) hydrant installed as part of a new development/extension shall be a standard 5' bury hydrant and shall be set to finished grade without the use of hydrant extensions (if an adjustment is required. Re-lay the water main and fire hydrant leg or install restrained offset as directed by SFC Utilities.)
- C. Weep holes must have 1/4" plugs removed and be free draining into gravel drain. Use fully restrained joint from the fire hydrant to the flanged connection on valve.
- D. See Tracing Wire Detail on Page 46.
- E. National Standard Fire Hose Coupling Screw Threads are required in Santa Fe County.
- F. Fire hydrant shall be painted and reflective numbers installed after installation, per specifications on Page 7, Section B.4.



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NOTE: See approved Construction Plans for hydrant Location Detail for Placement Dimensions and Directions.



Valve Installation

1. Valves shall be located at road intersection with the intent of isolating the water distribution system with the N-1 rule or as approved by SFC Utilities.
2. Inline valves shall typically be installed five (5) feet beyond the curb return as shown in the detail and consist of mechanical joint fittings with restraints except when using tees, which shall have mechanical joint x flange fittings.
3. Valves on fire hydrant legs shall have mechanical joint x flange fittings and shall connect to fire hydrant tee with the flange fitting and the mechanical joint fitting shall have a restraint, as shown in the detail.
4. Valves on tees shall have valves and tees with mechanical joint x flange fittings. The mechanical joint fitting shall have a restraint as shown in the detail.

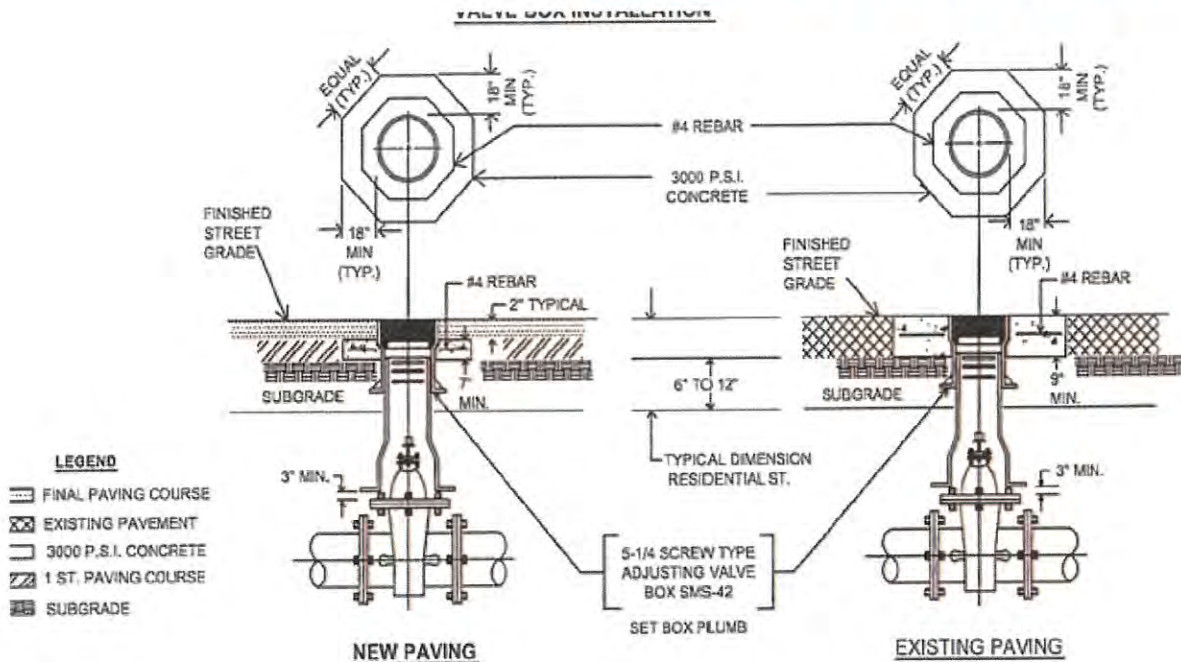
*Valve Box Installation on page 27



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Valve Box Installation:

New Paving: Valve Boxes shall be installed and raised to grade in the following manner for new paving.

1. Valve box shall be installed over valve during main installation. Top of valve box shall be left below the top of sub grade until valve is ready to be raised to final grade.
2. When the valve box is ready to be raised, an octagon shape shall be cut-out around the valve box from the first paving lift (as shown in detail) the valve box shall be raised to the finished street grade; the soil around the valve box shall be thoroughly compacted in accordance with SFC standards; the concrete collar (consisting of 3,000 PSI concrete and #4 rebar) shall be poured flush with top of the first paving course (including hand rodding concrete to remove voids) and the valve box shall be protected from vehicular traffic for 24 hours. .

Existing Paving: Install valve boxes per "New Paving" (above) with the concrete collar poured flush with the finished grade of the existing paving with a smooth troweled finish. Note: If excavation over 42" square is required to adjust valve box to grade, "New Paving" concrete collar procedures shall be followed as well as any necessary paving shall be completed.

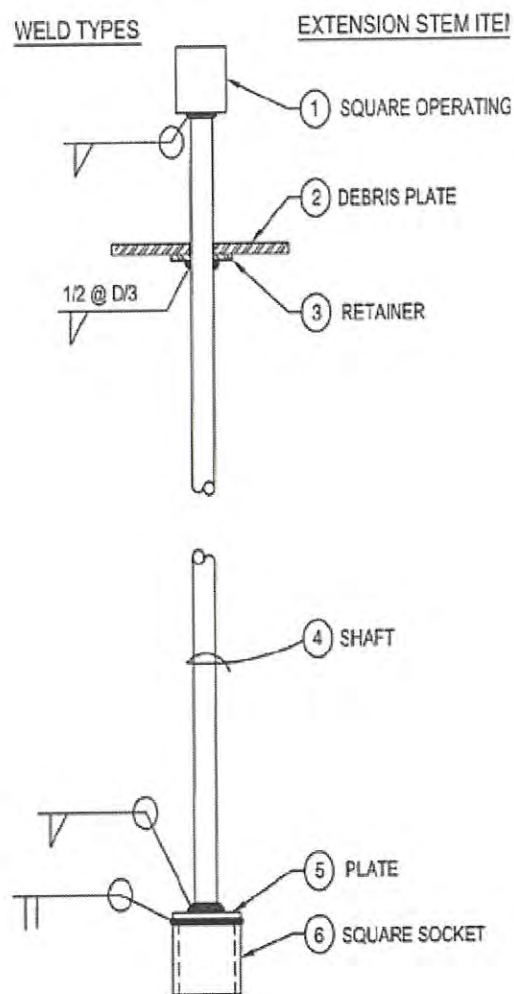
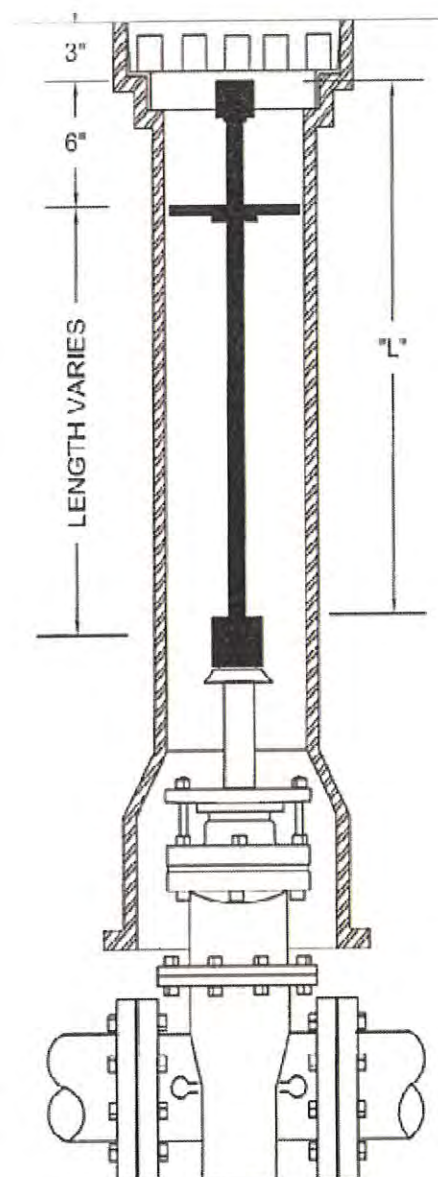
Unpaved Areas: In dirt or gravel streets, top of valve box and concrete collar shall be left 6" below the street grade. In other unpaved areas, valve box and concrete collar shall be left 2" above finished grade or as directed by SFC Utilities.

Protection of Valve Boxes: Valve boxes shall be protected from damage, loss and shall not be filled with dirt and debris. Valves must be accessible during construction with minimum excavation. Valves identified by SFC Utilities as key shut off valves shall remain at grade and protected during all phases of construction.



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Valve Stem Extension Detail	
<p>Item</p> <ol style="list-style-type: none"> 1. 2" x 2" x 2" Bar 2. 5" Dia. Plate 3/16" with 1-3/8" Dia. Hole 3. 1-3/8" Dia. Heavy Washer 	<p>Item</p> <ol style="list-style-type: none"> 4. 1" Dia. Schedule 40 Steel Pipe (L < 6') 1-1/4" Dia Schedule 40 Steel Pipe (L > 6") 5. 2-1/2" x 2-1/2" x 1/4" Plate 6. 2-1/2" x 2-1/2" x 1/4" Tubing

NOTE: All steel to be saw or machine cut.



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THRUST RESTRAINT TABLE BENDS, TEES, CAPS/VALVES, & REDUCERS (RESTRAINED JOINT LENGTHS IN FEET)													
DIAMETER (IN.)	HORIZONTAL BENDS				CAPS / PLUGS / VALVES L _R	SIZE (IN.) Lg/ Sm/ Run X Br.	TEES				REDUCERS		
	11-1/4°		22-1/2°				45°		90°				
	L _R	TOP/BOTTOM	L _R	TOP/BOTTOM			L _R	TOP/BOTTOM	L _R	TOP/BOTTOM	Run L _R	Branch L _R	Run L _R
4	FJO	2	5	12	34	4 X 4	FJC	28	8	10	FJO	N/A	
6	2	3	7	17	47	6 X 6	FJC	42	21	10	FJO	N/A	
8	2	4	9	23	62	6 X 4	FJC	26	5	10	FJO	24	
10	3	5	11	27	75	8 X 8	FJC	57	36	10	10	N/A	
12	3	6	13	32	88	8 X 6	FJC	40	13	10	FJO	26	
VERTICAL BENDS													
DIAMETER (IN.)	11-1/4°		22-1/2°		45°		90°						
	L _R	TOP/BOTTOM	L _R	TOP/BOTTOM	L _R	TOP/BOTTOM	L _R	TOP/BOTTOM					
4	3/2	7/4	9/6	14/9	20/12	N/A	N/A	N/A					
6	5/3	12/7	26/15	31/18	37/21	N/A	N/A	N/A					
8	7/4	15/9	18/10	37/21	N/A	N/A	N/A	N/A					
10	9/5	18/10	37/21	N/A	N/A	N/A	N/A	N/A					
12	9/5	18/10	37/21	N/A	N/A	N/A	N/A	N/A					
10 X 10 FJC 69 5 48 10 21 N/A													
10 X 8 FJC 55 5 29 10 FJO 25													
10 X 6 FJC 39 5 4 10 FJO 46													
10 X 4 FJC 21 5 FJO 10 FJO 61													
12 X 12 FJC 83 5 61 10 34 N/A													
12 X 10 FJC 68 5 42 10 10 43													
12 X 8 FJC 54 5 22 10 FJO 47													
12 X 6 FJC 37 5 FJO 10 FJO 64													
12 X 4 FJC 18 5 FJO 10 FJO 77													

Joint Restraint Table

Table: This table is based on the EBAA Iron Mega lug joint calculations program with the following input criteria: 3.5ft depth of bury (Conservative); trench type 4; PVC pipe material: GM soil type: 150 psi test pressure: 1.5 safety factor. Specific calculations for restrained lengths are required for conditions not covered by this table.

L_R: Length of restrained pipe, in feet, for each side of the fitting.

Minimum Restrained Length: A minimum restrained length of 5 ft. from the fitting joint is recommended. Vertical offsets shall be completely restrained between the top vertical fitting and the bottom vertical fitting.

FJO: Fitting joint Only – This includes at least a 1 ft. length of restrained pipe beyond the fitting joint.

Vertical Offset: Use 11-1/2° bends or 22- 1/2° bends wherever possible due to the shorter restrained length requirements.

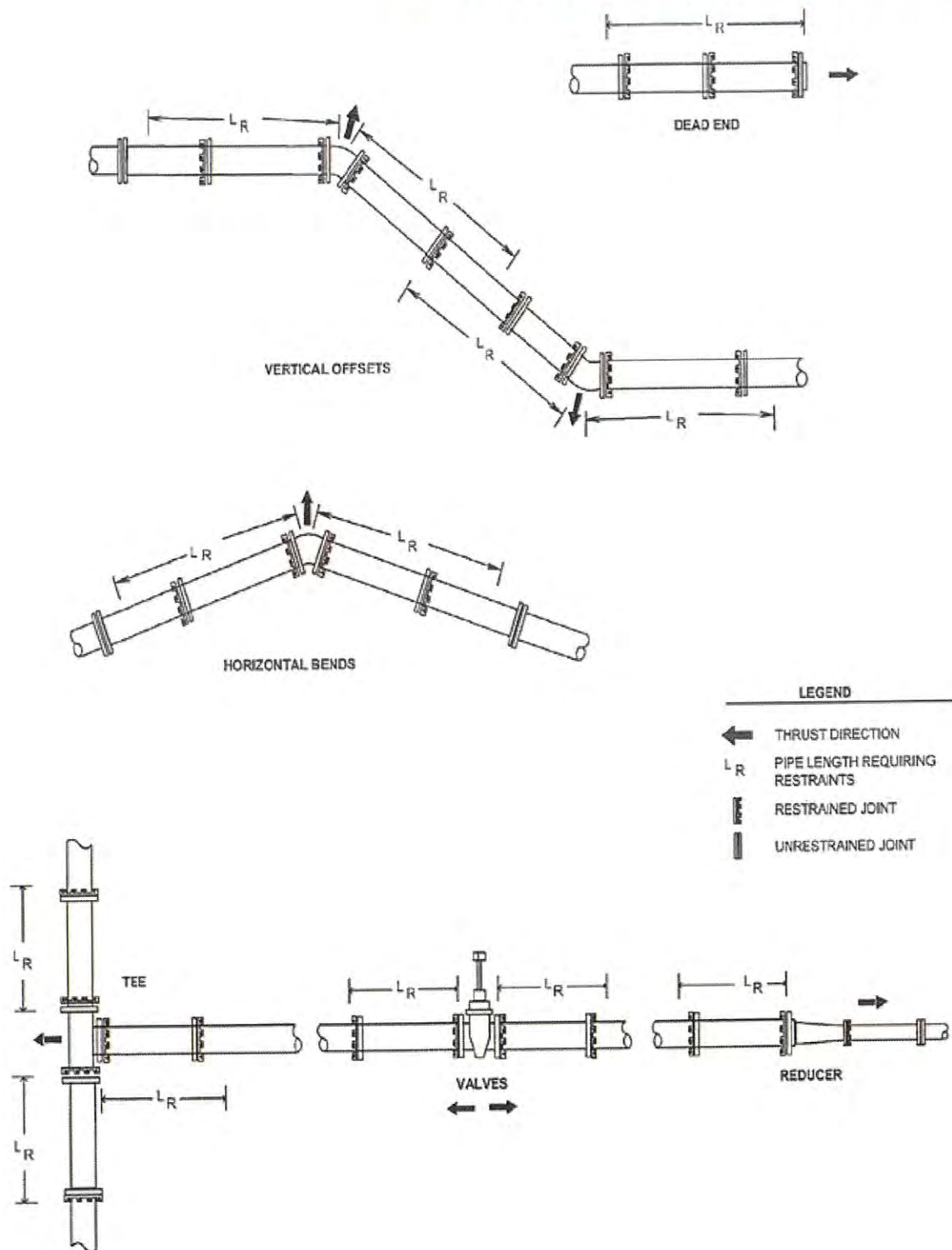
Caps/Plugs: Concrete blocking may be required by SFC Utilities on a case-by-case basis in addition to mechanical restraint.

Pipe Length: Piping shall be laid out to minimize pipe joints near fittings. Wherever possible, full 20ft. pipe lengths shall be utilized when connecting to fittings or valves. No pipe bell joints shall be used where fittings are less than 20 ft. apart.



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



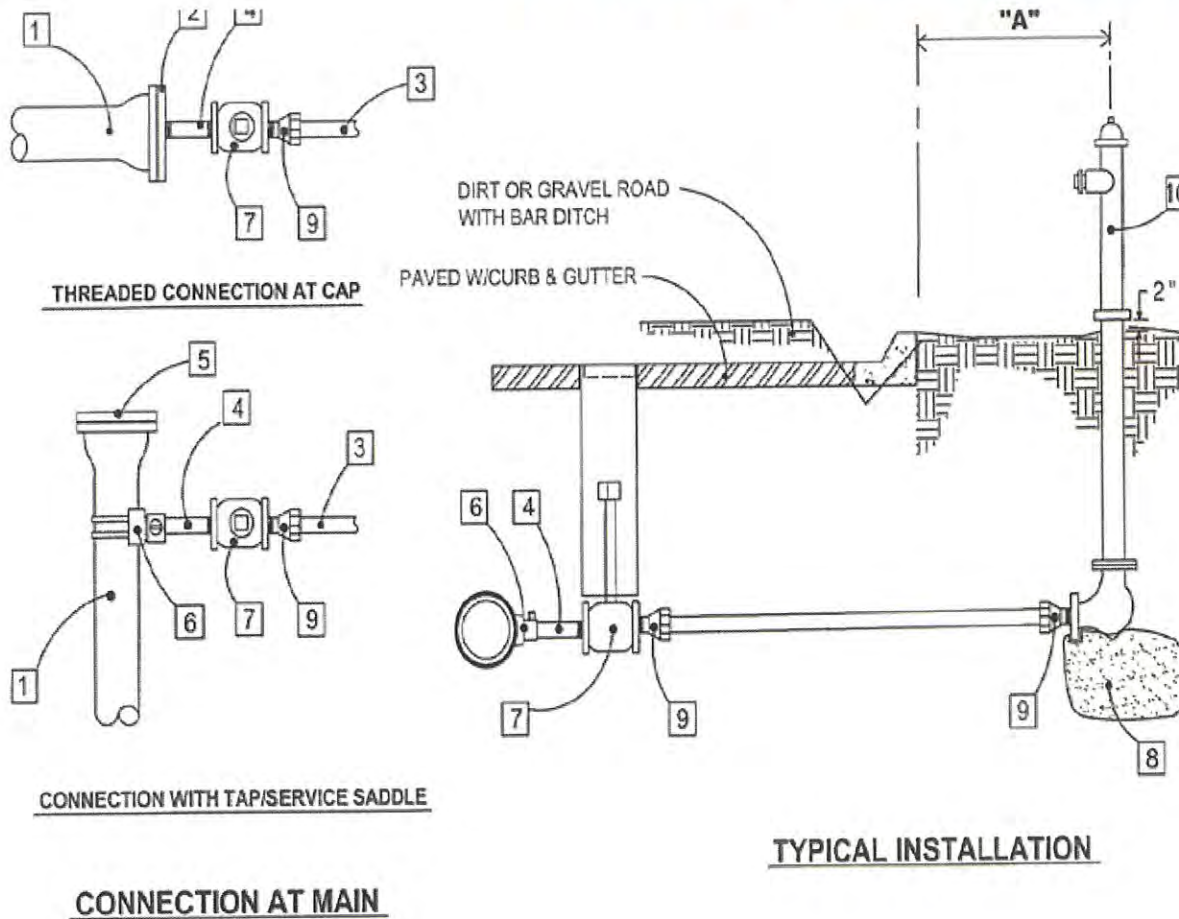
Joint Restraint Detail

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Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Flush Hydrant Detail	
Item 1. Restrained Dead End Main 2. MJ Cap/Plug with 2" Tap 3. 2" Type "K" Copper 4. 2" Brass Nipple 5. MJ Clamp / Plug	Item 6. 2" Service Saddle with IPS Threads 7. 2" Heavy Duty Threaded Gate Valve with box. 8. 1/4 Yard of Gravel at Drain 9. Adapter: 2" Compression x 2" MIP 10. 2-1/4" Post Type Hydrant with National Standard Threads

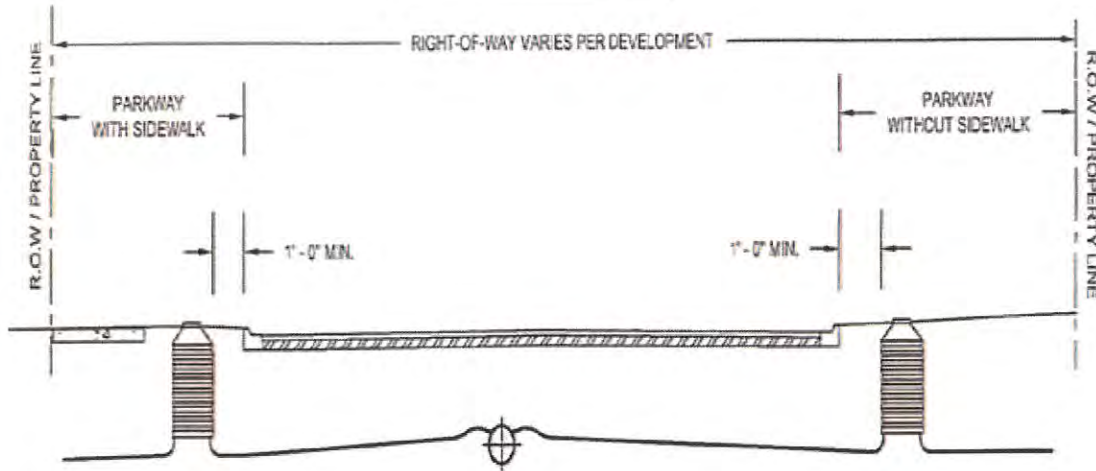
Construction Notes
1. Dimension "A" is typical 18" back of curb to valve in paved areas and is minimum of 18" behind bar ditch in unpaved areas but can be extended up to 72" to fit field conditions.



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

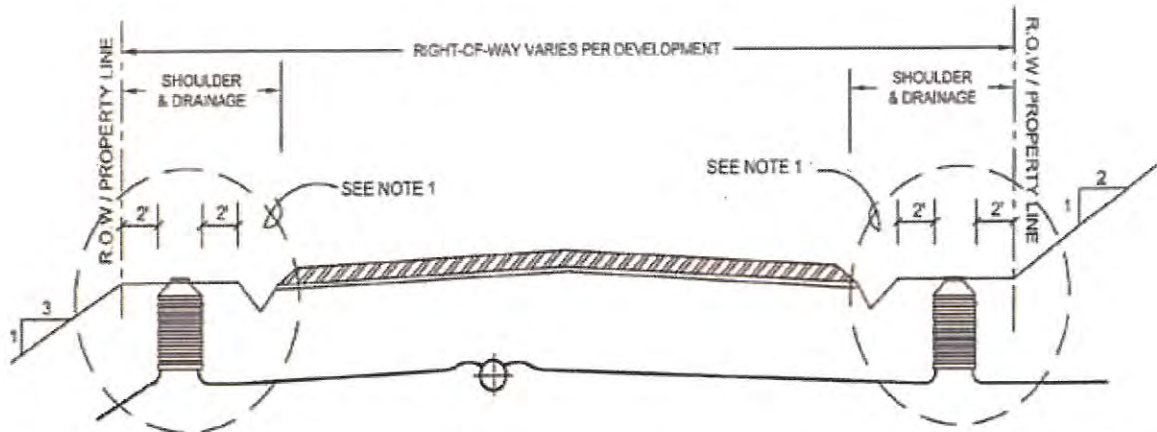
PAVED STREETS WITH CURB



Construction Notes

1. Meter cover to be flushed with top of curb.
2. Installation shall be run perpendicular to water main.

PAVED STREETS WITHOUT CURB



Construction Notes

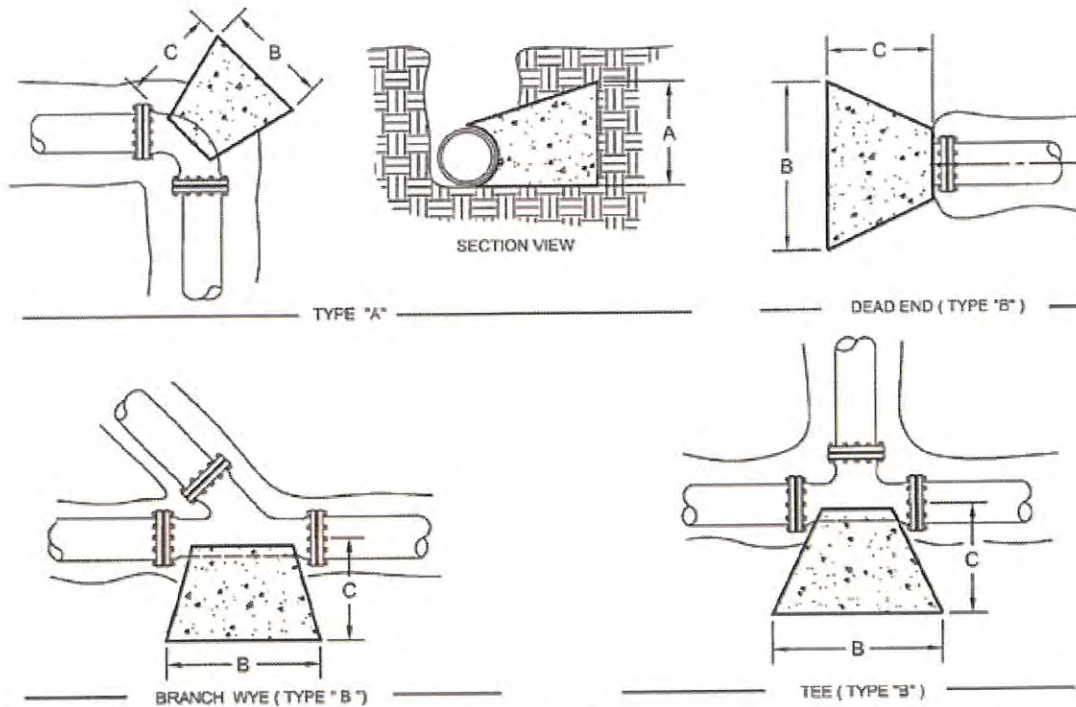
1. Do not locate meter cans or fire hydrants in slopes unless approved by SFC Utilities and benching is provided as shown. A minimum bench of 2" shall be provided all around as shown.
2. Service installation shall be run perpendicular to water main.



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

**Use Mechanically Restrained Fittings & Pipe Joints for Thrust
Restraint Unless Concrete Blocking is Specifically Called for by SFC Utility**



THRUST BLOCK SIZING TABLE

PIPE DIAMETER	TYPE "A" BENDS												TYPE "B" FITTINGS		
	11-1/4°			22-1/2°			45°			90°			A	B	C
	A	B	C	A	B	C	A	B	C	A	B	C			
4"	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
6"	12	12	12	12	12	12	12	18	12	18	24	12	12	24	12
8"	12	12	12	12	18	12	18	24	12	24	30	18	18	30	12
10"	12	12	12	12	24	12	20	30	12	24	42	18	24	36	18
12"	12	18	12	18	24	12	24	36	18	32	48	24	24	42	18
14"	12	24	12	18	36	18	30	42	24	36	60	24	30	48	24
16"	18	24	24	24	36	24	30	40	24	42	66	24	36	54	24
18"	18	30	24	24	40	24	36	54	24	48	72	24	42	60	24
20"	20	30	24	30	42	24	42	60	24	54	80	24	42	78	24
24"	24	36	24	36	54	24	48	72	24	66	96	30	54	80	30

1. TABLE BASED ON 200 P.S.I. (130 P.S.I. WORKING PRESSURE) AND 3000 LB/FT² ALLOWABLE SOIL BEARING PRESSURE.
2. USE TEE OUTLET DIAMETER TO DETERMINE THRUST BLOCK SIZING. USE BRANCH DIAMETER ON WYE TO DETERMINE THRUST BLOCK SIZING.
3. THE "C" DIMENSION LISTED IS A MINIMUM DIMENSION. CONCRETE BLOCKING MUST BE POURED TO THE UNDISTURBED SOIL OF THE TRENCH WALL.

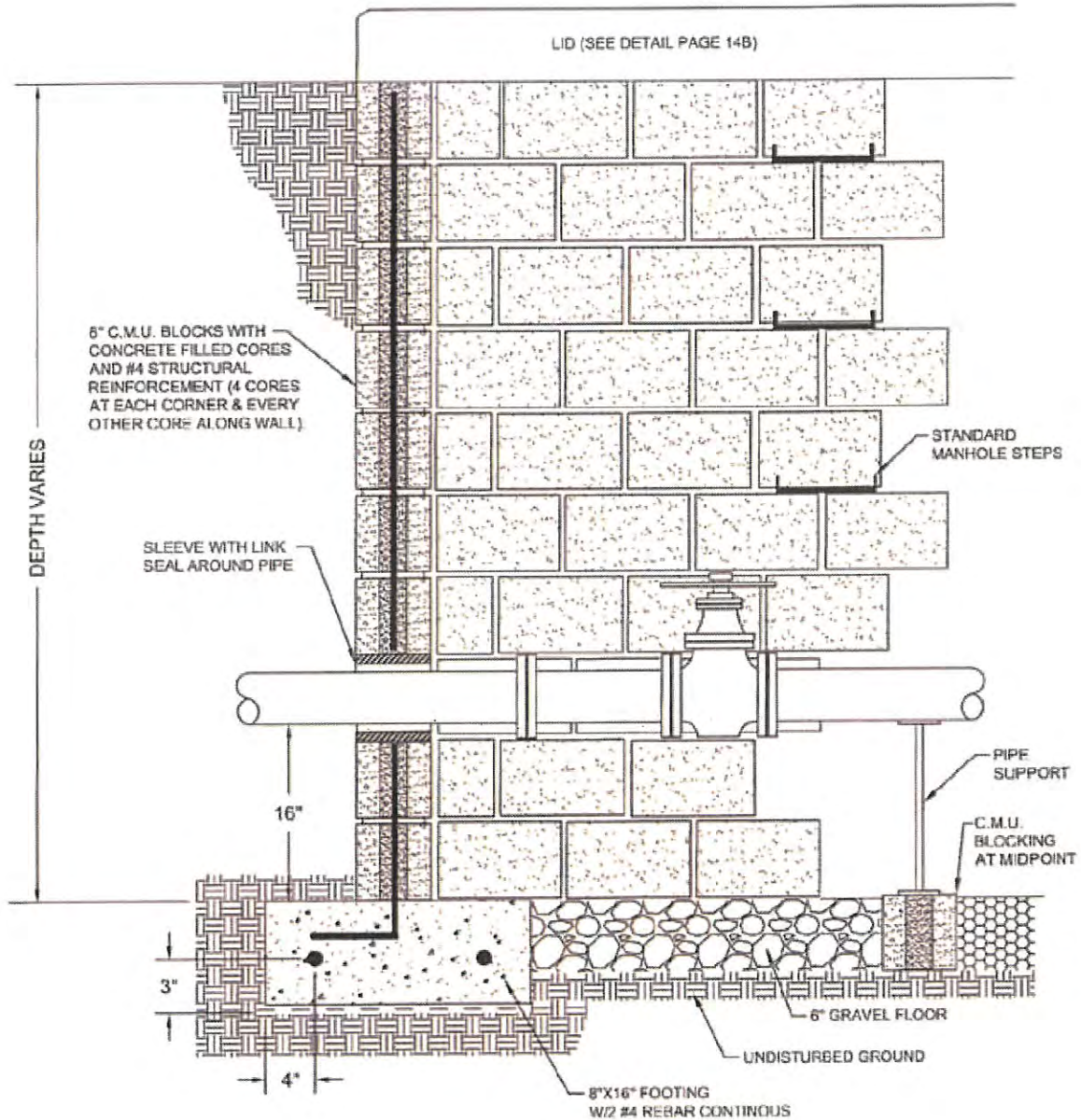
Concrete Thrust Blocking Detail



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Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

Meter and PRV Vaults may be Cast in Place Concrete, CMU, Precast Concrete or
Prefabricated per Section C.25 of the Approved Materials List

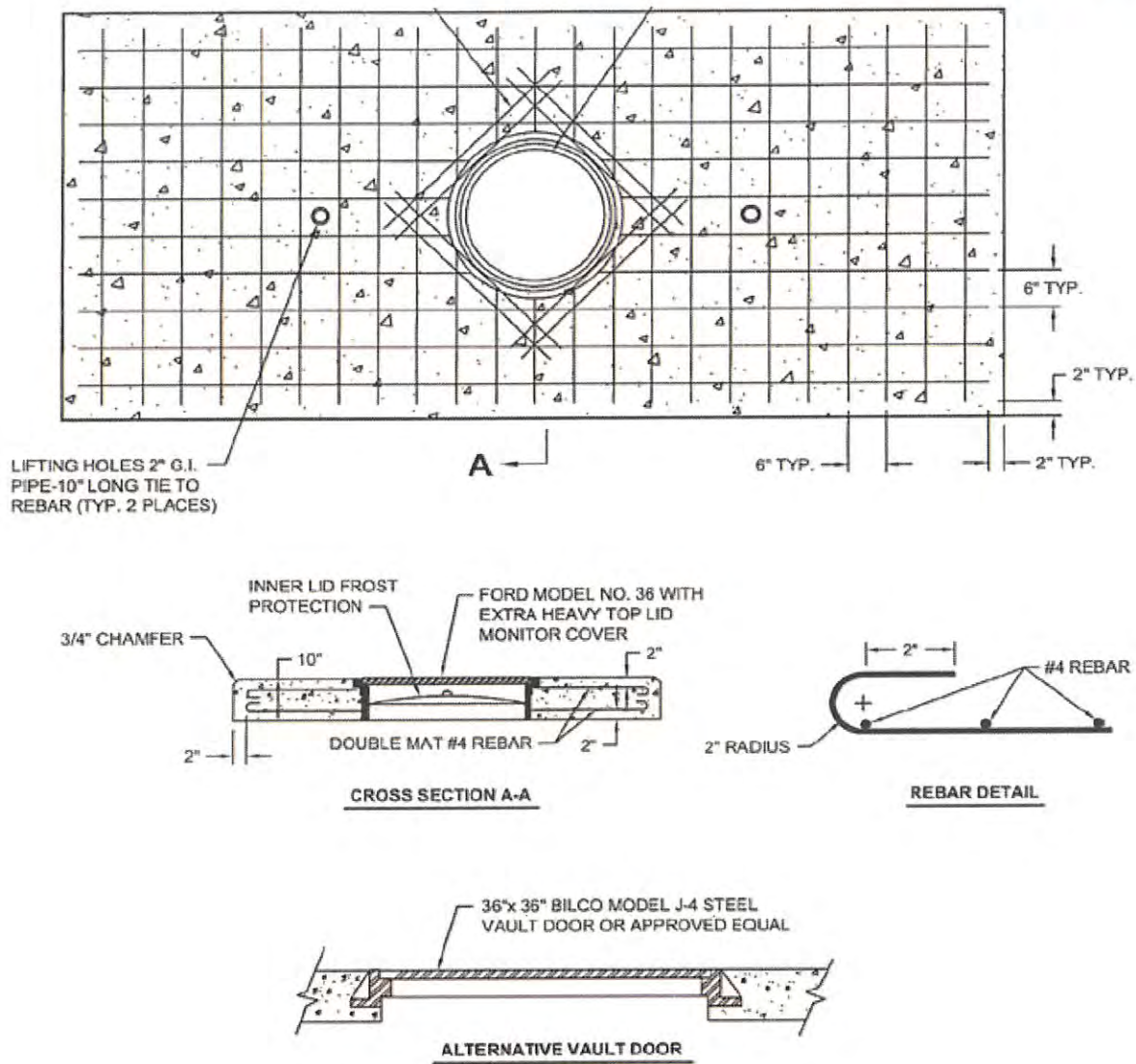


Vault Detail



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



1. Lid to be cast into sections weighing a maximum of 4,000 lbs. Each section to have two (2) lifting holes.
2. This is a general detail. Each pit will have a specific detail drawing issued for construction.

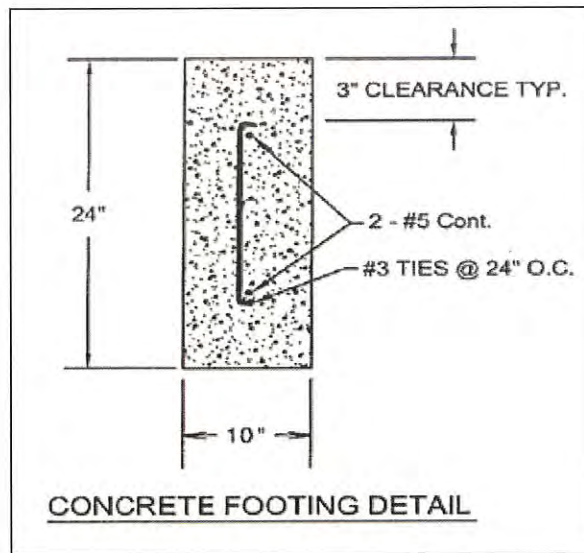
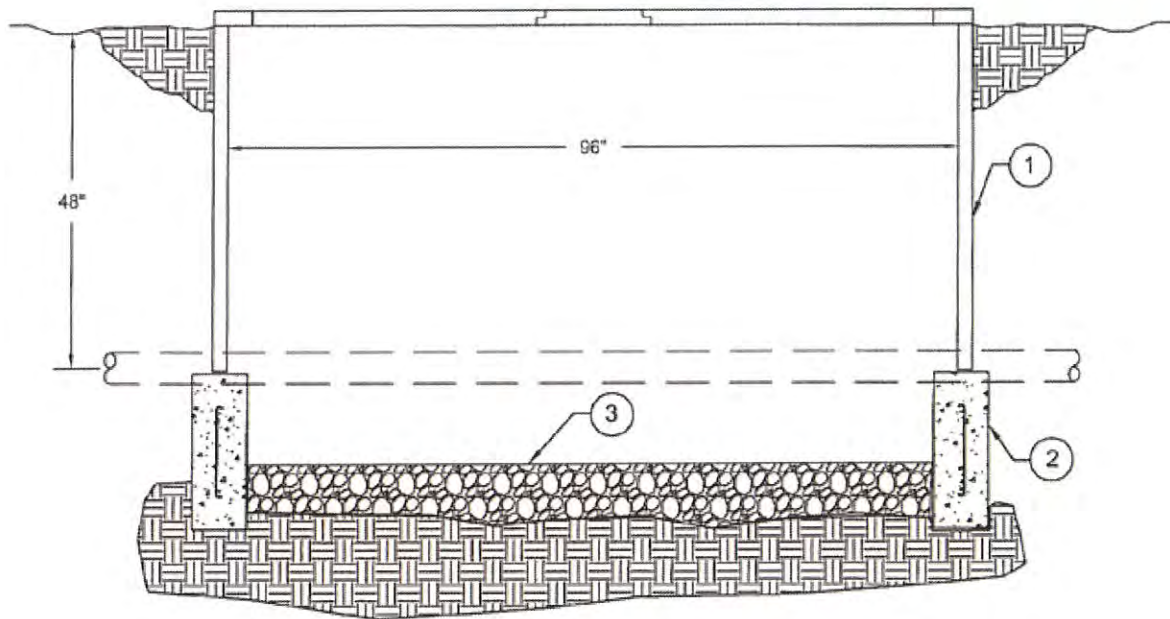
Vault Lid Detail



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

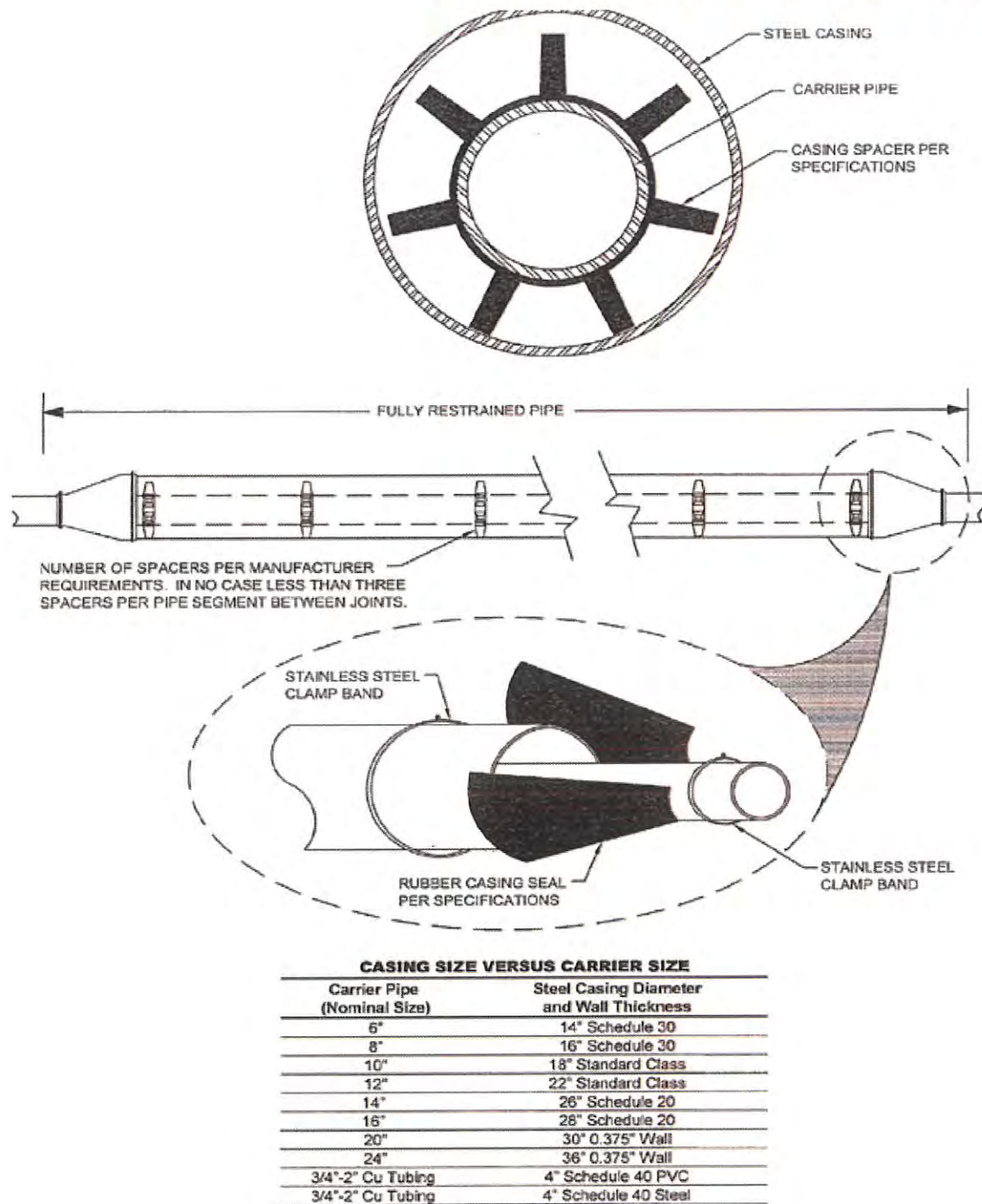


Prefabricated Vault Detail	
Item	Item
1. Prefabricated Vault 48" x 96" x 48" (Per Section C.25 of the Approved Materials List)	3. Gravel Floor 3/4" Crushed – 6" Thick
2. Concrete Footing	



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



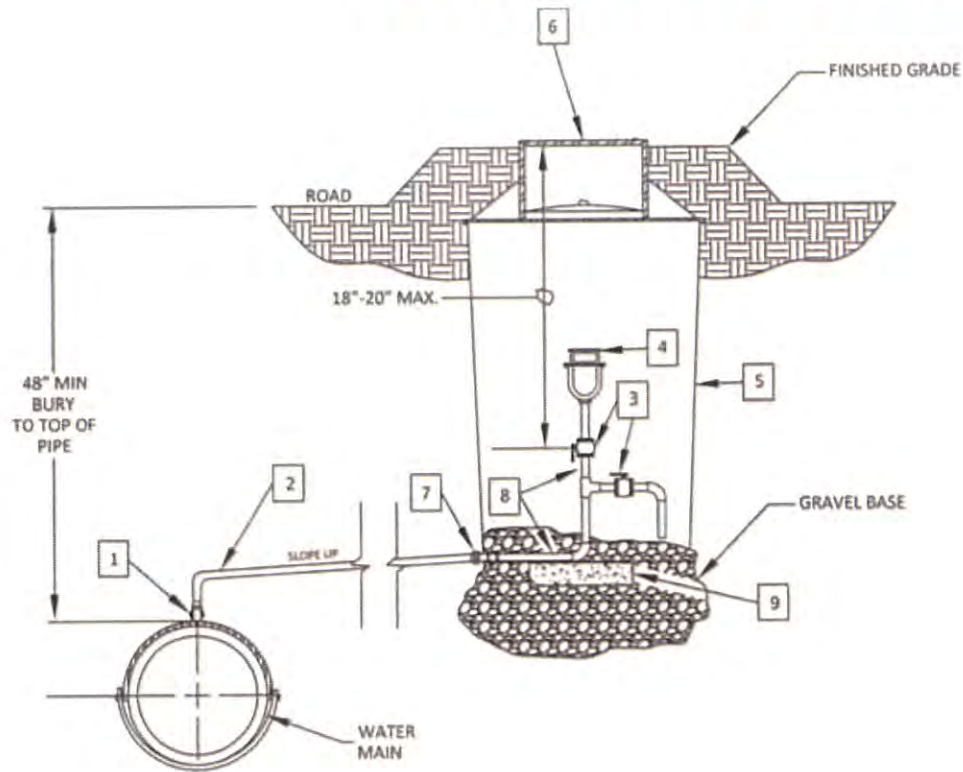
Pipe Casing Detail for Water or Sewer Projects



Santa Fe County Water Utilities
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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



1" and 2" Air-Vacuum Valve Detail

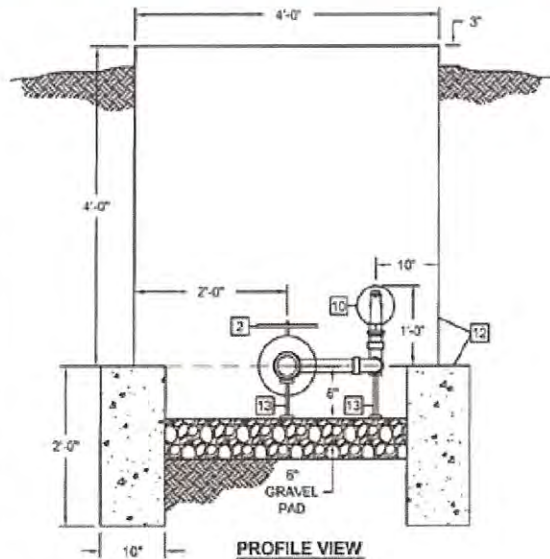
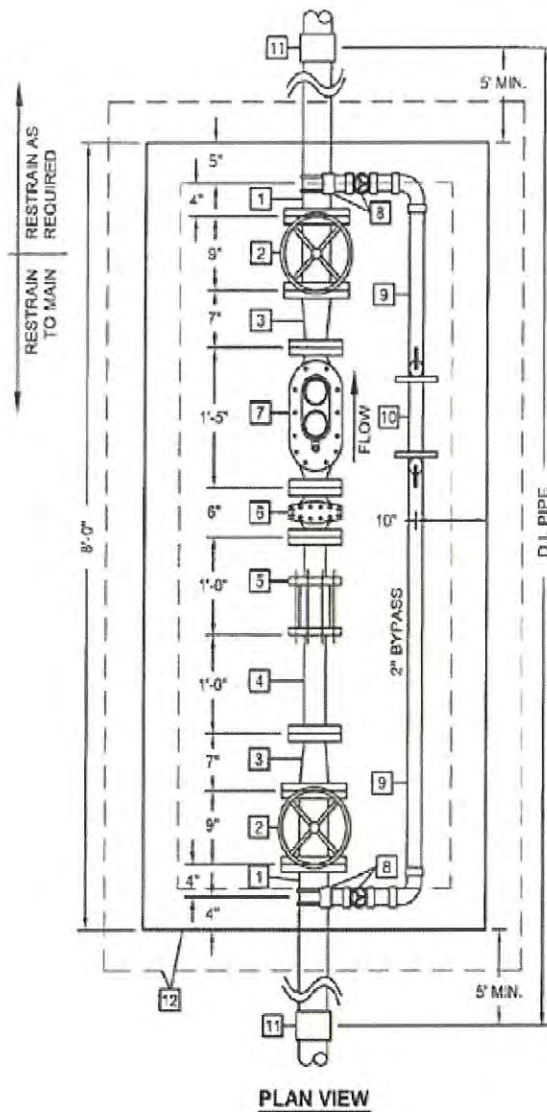
Item	Item
1. 1" or 2" Tapping Saddle	5. Follow specifications for a 2" single service Meter Box as shown on Page 24.
2. 1" or 2" Corporation Cock (A.W.W.A Tapered Thread)	6. 20" Dia. Polymer Lid: See C.16
3. 1" or 2" Type "K" Copper	7. 1" or 2" Adapter Coupling
4. 1" or 2" Brass Ball Valve	8. 1" or 2" Threaded Brass Pipe
5. 1" or 2" NPT Combination Air & Vacuum Unit Valve & Pressure Unit: Crespin 201C or 202C with Protect-top	9. 12"X12"X4" Concrete Block

Location: Where water main is installed in road, the air-vacuum valve installation shall be located out of the pavement and out of bar ditch, but within right-of-way or easement.



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Construction Notes

1. Contractor shall use 12"wx12"Lx6"H concrete block & pipe jack style support bolted into concrete w/lag bolts. Two (2) supports shall be installed for main line & two (2) supports shall be installed for bypass.
2. Contractor shall locate meter vault behind curb & cutter in area that is not subject to vehicular traffic.
3. Contractor shall slope grade away from the vault.
4. Contractor shall install compression fitting for 2" bypass piping.
5. Contractor shall install four (4) all threads at meter location to maintain meter opening and piping alignment.

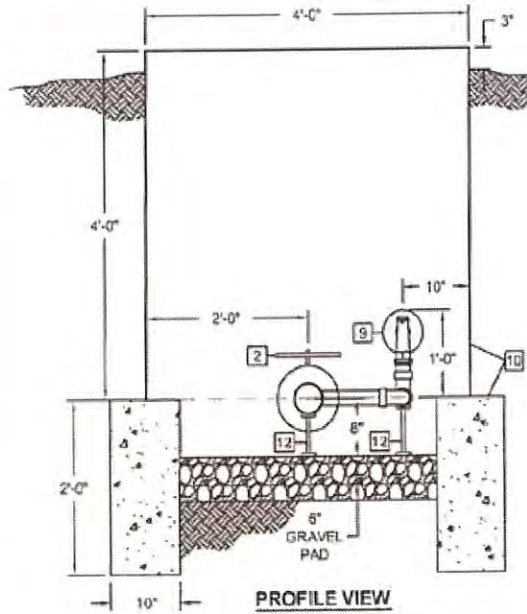
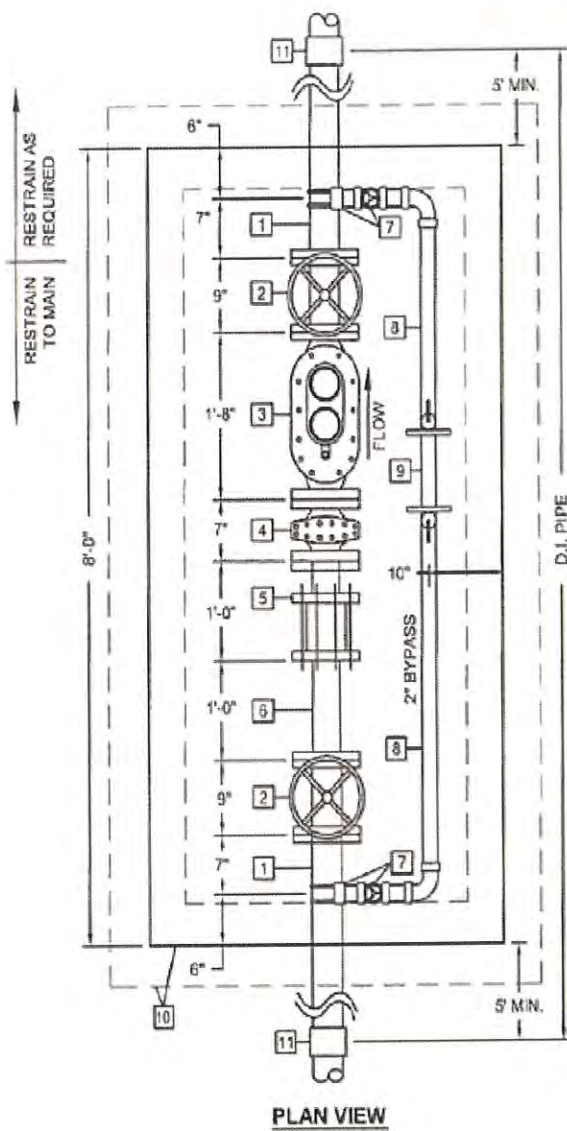
3" Domestic Service Detail

Item	Item
1. 4" Flg x PE Connection Piece	8. 4" x 2" Service Saddle with 2" Corp. Stop Style Ball Valve
2. 4" Flg x Gate Valve with Handwheel	9. 2" Type "K" Ridge Copper & Fittings
3. 4" x 3" Flg Reducer	10. 2" Prefabricated Meter Setter w/ 2" Ball Angle Valves (Per SFC Utilities Detail)
4. 3" Flg x PE Connection Piece	11. Solid Sleeve Connection between Ductile Iron Pipe and Existing Pipe.
5. 3" Flg Coupling Adapter	12. 4'x4'x8' prefabricated vault w/concrete foundation (per SFC Utilities detail)
6. 3" Flg Meter Strainer (Furnished & Installed by SFC Utilities)	13. Pipe Support
7. 3" Compound Water Meter (Furnished and Installed by SFC Utilities)	



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Construction Notes

1. Contractor shall use 12"wx12"Lx6"H concrete block & pipe jack style support bolted into concrete w/lag bolts. Two (2) supports shall be installed for main line & two (2) supports shall be installed for bypass.
2. Contractor shall locate meter vault behind curb & cutter in area that is not subject to vehicular traffic.
3. Contractor shall slope grade away from the vault.
4. Contractor shall install compression fitting for 2" bypass piping.
5. Contractor shall install four (4) all threads at meter location to maintain meter opening and piping alignment.

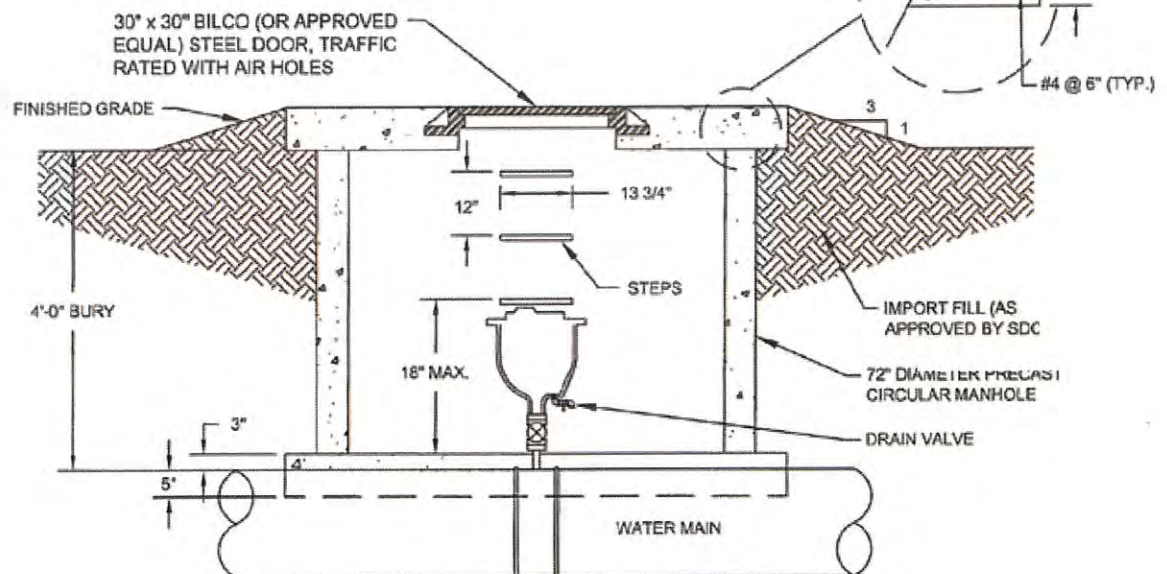
4" Domestic Service Detail

<u>Item</u>	<u>Item</u>
1. 4" Flg x PE Connection Piece	8. 2" Type "K" Ridge Copper & Fittings
2. 4" Flg x Gate Valve with Handwheel	9. 2" Prefabricated Meter Setter w/ 2" Ball Valves (Per SFC Utilities Detail)
3. 4" Compound Meter (Furnished & Installed by SFC Utilities)	10. 4'x8' prefabricated vault w/concrete foundation (per SFC Utilities detail)
4. 4" Meter Strainer (Furnished & Installed by SFC Utilities)	11. Solid Sleeve Connection between Ductile Iron Pipe and Existing Pipe.
5. 4" Flg Coupling Adapter	12. Pipe Support
6. 4" Flg x PE Connection Piece	
7. 4" x 2" Service Saddle with 2" Corp. Stop Style Ball Valve	



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

PUBLIC UTILITIES WATER AND WASTEWATER

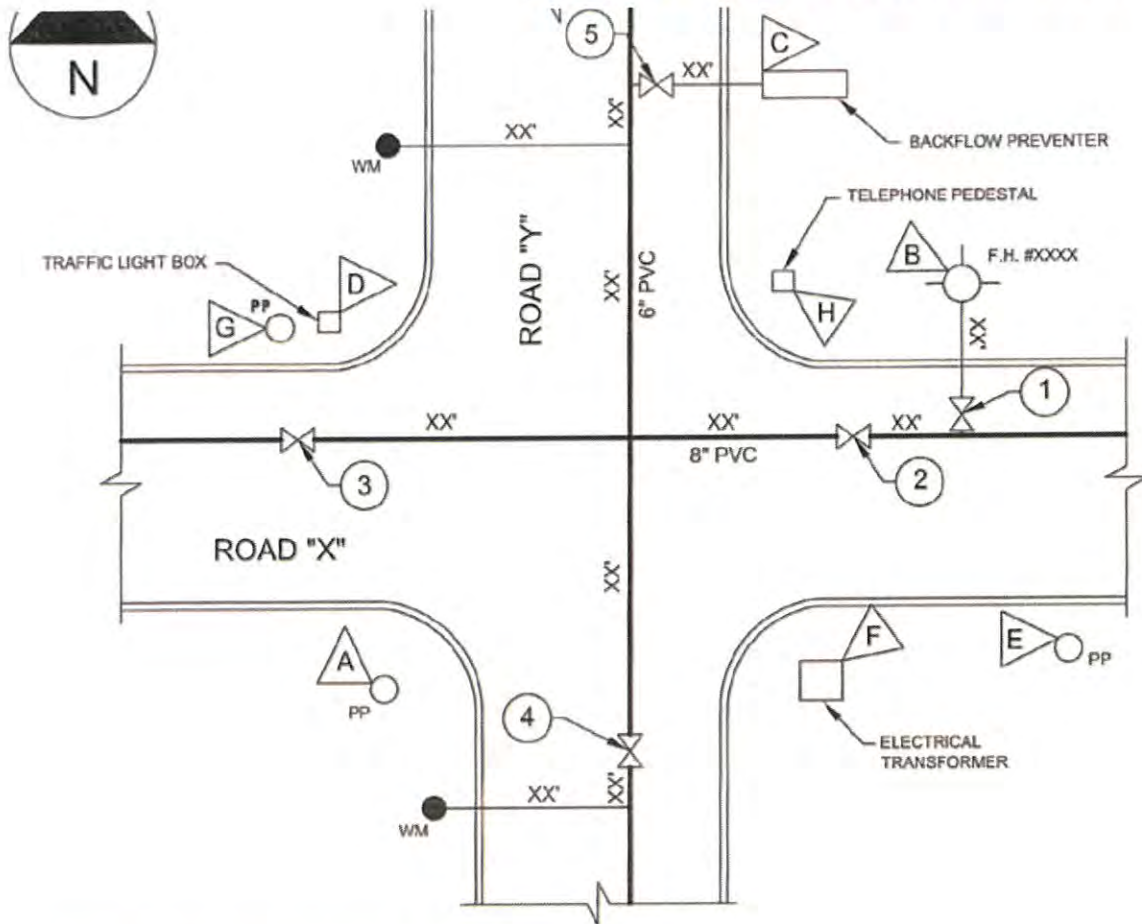


3" and Larger Air-Vacuum Valve Vault Detail



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



FROM POINT	TO VALVE				
	①	②	③	④	⑤
▲			XXXX"	XXXX"	
▲	XXXX"	XXXX"			
▲			XXXX"		XXXX"
▲	XXXX"	XXXX"			XXXX"
▲	XXXX"	XXXX"		XXXX"	
▲			XXXX"	XXXX"	XXXX"

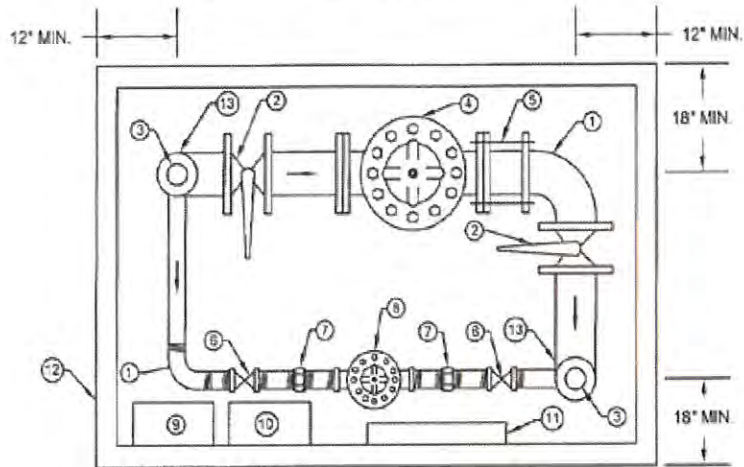
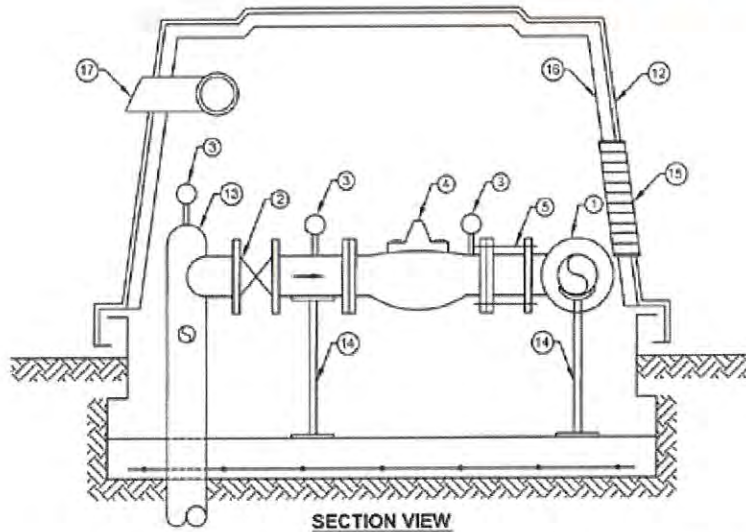
1/4"
12"

Valve Referencing Notes:

1. All valves shall be referenced during construction with 3 swing ties from suitable reference points and the ties recorded on the construction drawing.
2. All reference points shall be easily field identified and shall consist of: Permanent Land marks (IE. Fire hydrants, power poles, electronic transformers, telephone pedestals, Etc.) that will box be relocated or removed during construction.
3. All fire hydrant valves shall be referenced with a dimension from the center of the hydrant to the valve box and shall have a minimum of one (1) swing tie from a separate reference point.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Notes:

1. Pressure gauges shall be 4" oil filled gauges & counted on pressure gauge mounting panel (see Detail)
2. Pressure reducing valves shall be Clv-Val (model 90-01AN) or approved equal.
3. Pressure reducing valve vaults shall be above grade vaults as manufactured by Engineer Fluid Inc. Canaris, or approved equal.
4. Sacrificial anode is required for cathodic protection on prefabricated enclosure base.
5. Enclosure shall be painted per manufacturer recommendation with color approved by SFC Utilities.
6. Concrete slab shall be 6-inch thick with #5 rebar at 12" O.C. for reinforcement.

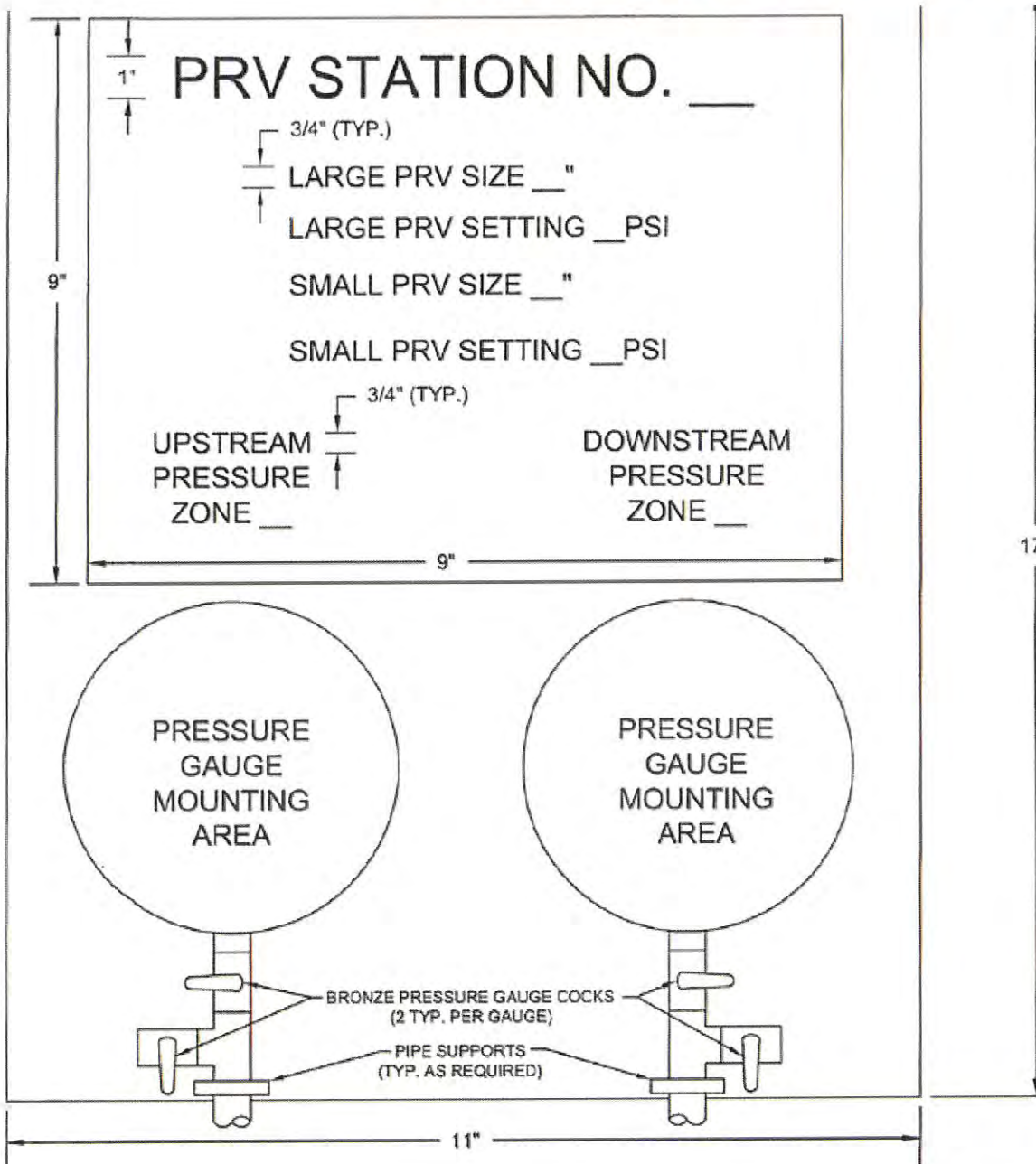
Private Pressure Reducing Valve Detail

Item	Item
1. 90° Elbow	9. Heater Unit
2. Butterfly Valve	10. Power panel w/two (2) GFI Outlets
3. Pressure Gauge	11. Pressure Gauge Mounting Panel
4. Pressure Reducing Valve (Sized for high demand flow rates)	12. Prefabricated Enclosure
5. Flange coupling adapter	13. Welding Tee Riser
6. Ball valve	14. Pipe Support
7. Union	15. Air Vent
8. Pressure reducing valve (sized for low demand flow rates)	16. Foam Insulation
	17. Exhaust Fan
	18. Concrete Slab



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



Notes:

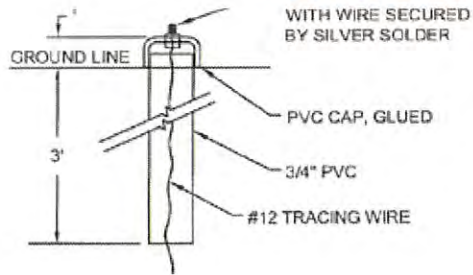
1. Pressure gauge mounting plate shall be constructed of 3/8" aluminum
2. Mounting plate shall be mounted to wall using 13/16" depth x 13/16" wide unistrut and four (4) 3/8" dia. X 2-1/2" long SS lag bolts with lag shield for concrete.
3. Label plate shall be stainless steel acid etched and color filled.



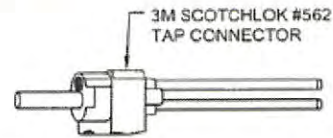
Santa Fe County Water Utilities
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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

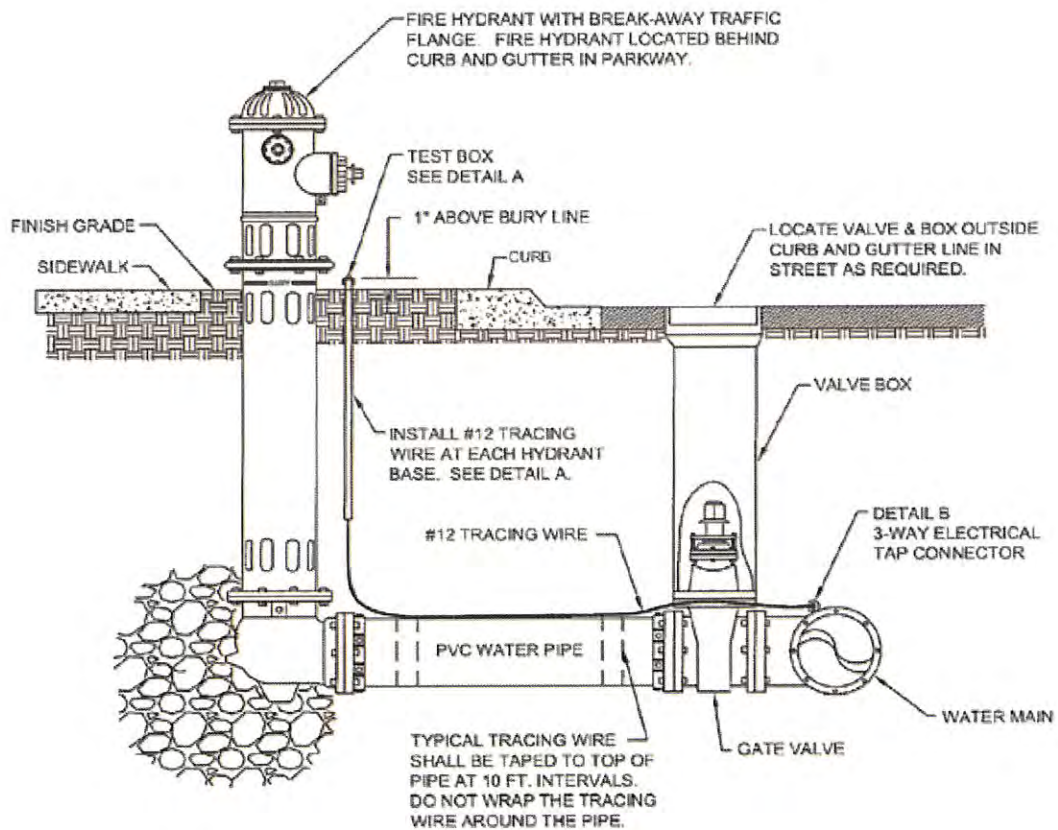


DETAIL A
TEST BOX



NOTE: WRAP CONNECTOR AND WIRE ENDS WITH GENERAL PURPOSE TAPE SEALANT TO MAKE THE CONNECTION MOISTURE PROOF (NOT SHOWN).

DETAIL B
ELECTRICAL TAP CONNECTOR



TRACING WIRE DESIGN AND DETAILS COURTESY
F. PEAK POWER ENGINEERING, INC.
109 AGUA FRIA, SANTA FE, NM 87507

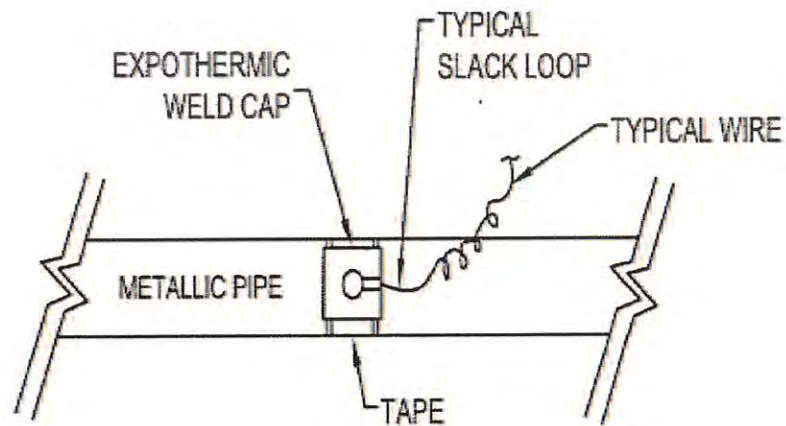
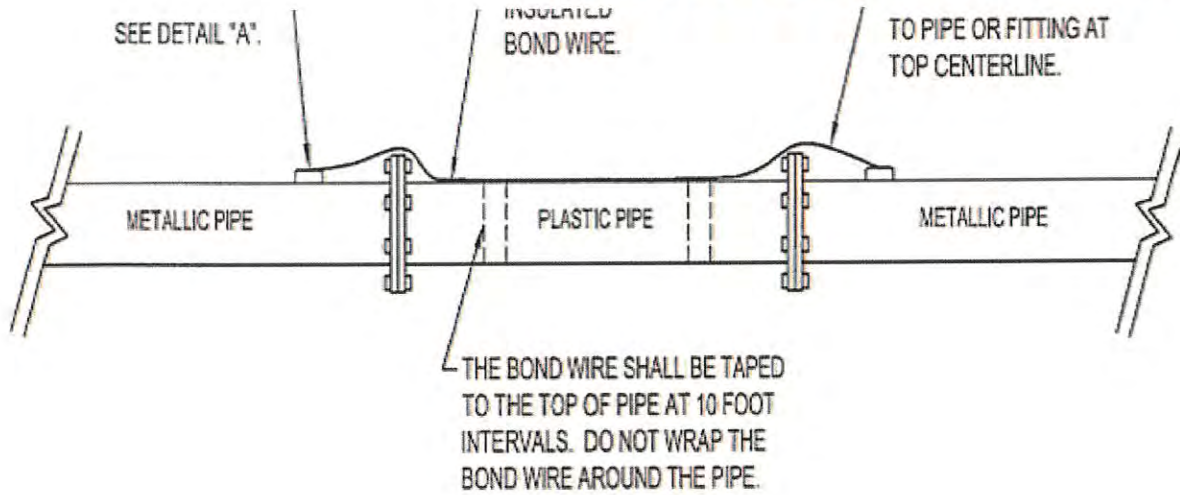
Tracing Wire Detail



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Water and Sewer Construction Standards and Specifications

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**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



Bonding Jumper Detail



Santa Fe County Water Utilities
Water and Sewer Construction Standards and Specifications

PUBLIC UTILITIES WATER AND WASTEWATER

1. The first section of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in all dealings, particularly in the context of public administration and government operations. The text outlines various methods for data collection, storage, and analysis, ensuring that information is readily accessible and reliable.

2. The second section focuses on the role of technology in modern governance. It explores how digital tools and platforms can streamline processes, reduce costs, and improve the efficiency of service delivery. The text highlights the importance of investing in infrastructure and training to ensure that the workforce is equipped to handle the challenges of a digital environment.

3. The third section addresses the issue of public participation and engagement. It discusses the various ways in which citizens can be involved in decision-making processes, from public consultations and town hall meetings to online platforms and social media. The text stresses the importance of creating a culture of openness and listening to the voices of the community.

4. The fourth section deals with the topic of transparency and accountability. It outlines the various mechanisms in place to ensure that public officials and organizations are held accountable for their actions. This includes the establishment of independent oversight bodies, the implementation of robust internal controls, and the promotion of a culture of integrity and ethical conduct.

5. The fifth section discusses the importance of data security and privacy. It outlines the various measures that must be taken to protect sensitive information from unauthorized access, disclosure, or misuse. The text emphasizes the need for strong security protocols, regular audits, and the implementation of data protection laws to ensure that the rights of individuals are protected.

6. The sixth section focuses on the topic of sustainability and environmental management. It discusses the various ways in which public organizations can contribute to the achievement of sustainable development goals. This includes the implementation of green procurement policies, the promotion of energy efficiency, and the adoption of sustainable practices in all aspects of operations.

7. The seventh section addresses the issue of human resources management. It discusses the various ways in which public organizations can attract, develop, and retain a high-quality workforce. This includes the implementation of competitive recruitment processes, the provision of ongoing training and development opportunities, and the promotion of a culture of excellence and high performance.

8. The eighth section deals with the topic of financial management and budgeting. It outlines the various measures that must be taken to ensure the sound and efficient use of public funds. This includes the implementation of robust financial controls, the promotion of cost-effectiveness, and the regular monitoring and reporting of financial performance.

9. The ninth section discusses the importance of communication and public relations. It outlines the various ways in which public organizations can effectively communicate their messages and engage with the public. This includes the development of clear and concise communication strategies, the use of a variety of communication channels, and the promotion of a culture of openness and transparency.

10. The tenth and final section provides a summary of the key findings and recommendations of the document. It emphasizes the need for a holistic and integrated approach to public administration, one that takes into account all aspects of the organization's operations and the needs of the community it serves. The text concludes by expressing confidence in the ability of public organizations to meet the challenges of the future and to achieve the highest standards of performance and service.

PUBLIC UTILITIES WATER AND WASTEWATER

LEGEND

NO.	DESCRIPTION
1	CONCRETE
2	STEEL
3	CAST IRON
4	BRICK
5	GLASS
6	PAINT
7	WOOD
8	ROOF
9	LANDSCAPE
10	WATER
11	VEGETATION
12	ROAD
13	RAILROAD
14	UTILITY
15	ADDITIONAL
16	REVISION
17	DATE
18	BY
19	PROJECT
20	SHEET

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, AS ADOPTED BY THE BOARD OF SUPERVISORS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
3. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL ADJACENT PROPERTIES AND UTILITIES AT ALL TIMES.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES AND STRUCTURES.
5. THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL DEBRIS AND EXCESS MATERIAL.
7. THE CONTRACTOR SHALL MAINTAIN THE SURFACE OF THE ROAD AND ADJACENT AREAS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE ENVIRONMENT.
9. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SAFETY MEASURES DURING CONSTRUCTION.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT PROPERTIES.
11. THE CONTRACTOR SHALL MAINTAIN ADEQUATE RECORDS OF ALL CONSTRUCTION ACTIVITIES.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT UTILITIES.
13. THE CONTRACTOR SHALL MAINTAIN ADEQUATE ACCESS TO ALL ADJACENT AREAS.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT STRUCTURES.
15. THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE DURING CONSTRUCTION.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL DEBRIS AND EXCESS MATERIAL.
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19. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SAFETY MEASURES DURING CONSTRUCTION.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT PROPERTIES.

PLAN VIEW @ A-A SECTION

PLAN VIEW @ A-A SECTION

PROFILE VIEW @ A-A SECTION

PROFILE VIEW @ A-A SECTION

PLAN VIEW @ B-B SECTION

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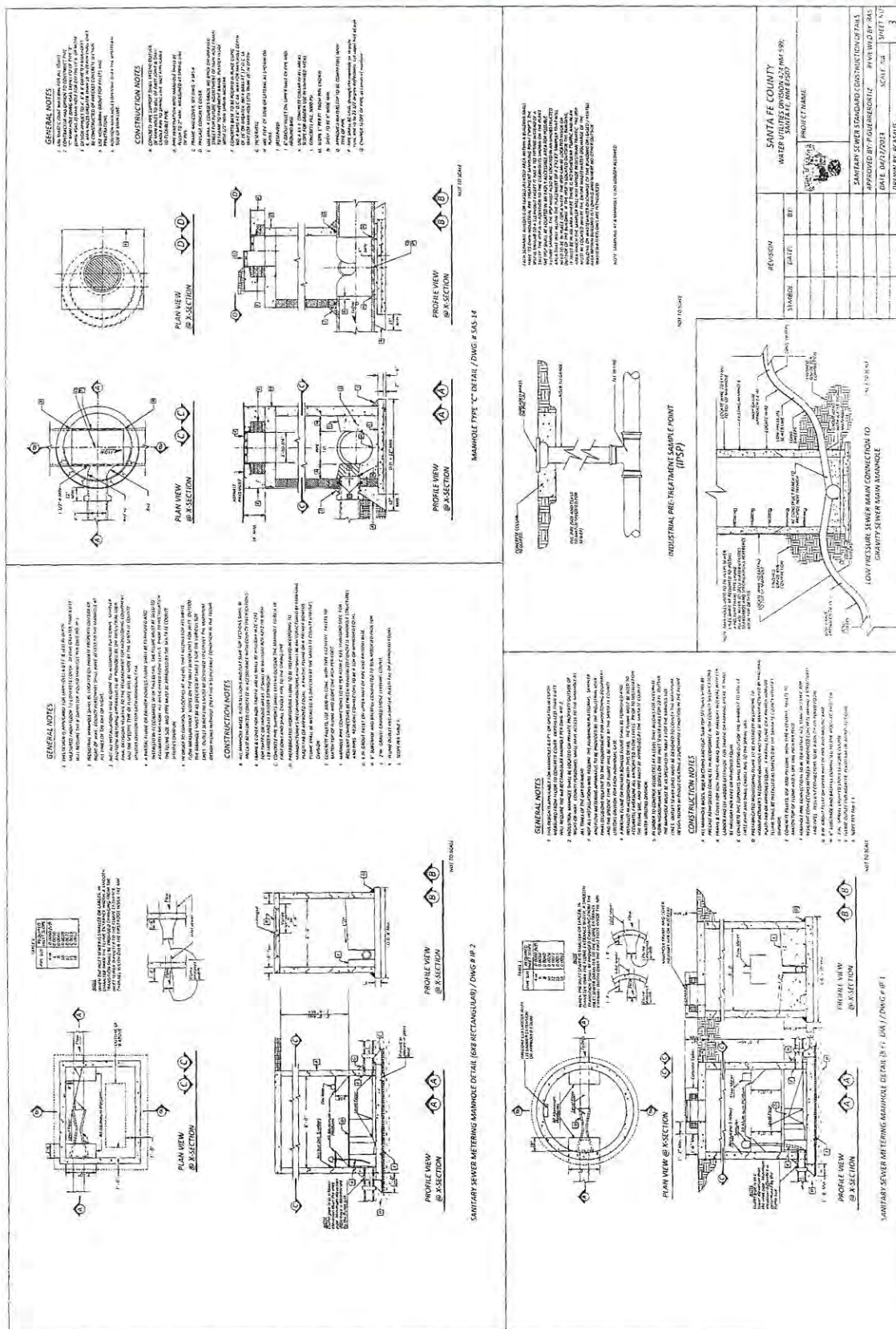
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EXHIBIT B

COUNTY OF SANTA FE

SANTARY SEWER DESIGN CRITERIA

EXHIBIT B

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INTRODUCTION

This document presents the criteria, standards and regulations related to the design of public sanitary sewer systems for general development service. It does not cover the criteria necessary for design of major interceptor sewers, or treatment facilities. The material is directed to the competent design professional and is not intended to be a detailed design handbook. Criteria and standards presented are those determined to be the minimum acceptable values necessary to result in system designs having satisfactory functional characteristics, durability and operational suitability. It is expected that the designer will strive for the best design to suit the circumstances involved, and that designs will reflect sound professional judgement at all times.

Section 1. GOVERNING REGULATIONS

Ordinances and policies related to the design and operation of sanitary sewer systems include the following:

A. LAND DEVELOPMENT ORDINANCES

These ordinances primarily require that sewer service be available to proposed developments before issuance of building permits. There are no specific design criteria included in these ordinances.

Section 2. ENGINEERING DESIGN CRITERIA FOR GRAVITY SEWER LINES

Unless otherwise authorized by the County's Utilities Department, for a specific project, specifications for pipe and other construction materials will be as required in the current edition of New Mexico Standard Specifications for Public Works Construction (NMSSPWC).

A. DESIGN CAPACITY CRITERIA

(1) Off-site flows shall be determined by the County Utilities Department.

(2) In areas with a mix of residential, commercial, industrial, etc., roughly representative of the county as a whole, the population of the contributing area shall be determined and the design flows calculated as follows:

$$Q^a - \text{Average Flow} = 80 * \text{Population}/10^6, \text{ in MGD}$$

$$Q^p - \text{Peak Flow} = 2.5 * Q^a, \text{ in MGD}$$

$$Q^d - \text{Design Flow} = 1.2 * Q^p \text{ in MGD (for cfs multiply MGD by 1.547)}$$

(3). Population loadings are assumed to be:

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2.5 persons for apartments, townhouses and mobile homes (DU)

3.3 persons for R-1 single-family homes (DU)

Where DU – Dwelling Unit

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(4). In primarily non-residential areas, design flows may be determined by other methods as may be appropriate, upon approval by the Department.

(5). Design shall be for full pipe flow at the design discharge.

(6). Manning's Formula shall be used for determination of pipe flow velocities and capacities using a value for Manning's $n = 0.013$, except for PVC & HDPE pipes for which designer shall use 0.009.

(a) Peak Velocity = Velocity at peak flow conditions

(b) Average Velocity = Velocity at average flow conditions

B. MANHOLE CRITERIA

(1) Manholes must generally be located on the centerline of the street right-of-way or the centerline of street width if the street is not concentric with the right-of-way. Manholes in curved streets may be located as much as 10' off from centerline of street or right-of-way; however, required clearances from other utilities must be maintained. The offset of such manholes is to be measured from center of manhole barrel to the centerline of the street or right-of-way.

(2) Standard minimum manhole depth is 6.0', measured from rim to invert.

(3) The required inside measurements or conditions for a manhole are as follows:

(a) Minimum inside diameter is 4 feet.

(b) A minimum 9" wide shelf must be provided on each side of each main line within the manhole.

(c) Where the main flow changes direction at a manhole, the manhole must be large enough so that the centerline radius of curvature of the flow invert will be larger than the pipe diameter.

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**MINIMUM MANHOLE DIAMETERS REQUIRED FOR DIRECTION
CHANGES**

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	<u>Degrees of Direction Change</u>							
Pipe ID	0°	5°	45°	50°	75°	80°	85°	90°
8" to 21"	4'	4'	4'	4'	4'	4'	4'	4'
24"	4'	4'	4'	4'	4'	4'	4'	6'
27"	4'	4'	4'	4'	4'	4'	6'	6'
30"	4'	4'	4'	4'	4'	6'	6'	6'
36"	6'	6'	6'	6'	{--NOT PERMITTED--}			
42"	6'	6'	6'	{--NOT PERMITTED--}				

(4) Changes in horizontal flow direction of more than 90° in a manhole shall not be permitted unless the following conditions are present:

(a) All lines are larger than 36".

(b) Continuous lines with a design flow greater than 3 MGD and a design velocity of 5fps or greater.

(c) Any junction of two flows, each with design flow greater than 3 MGD, where one line has a design pipe velocity of 5 fps or greater.

(5) Invert elevations will be called out for each inlet and outlet at a manhole.

(6) Drops across manholes will be provided as follows:

(a) Where the main flow does not change direction at the manhole, the design will provide:

(i) A slope across the manhole at least equal to the average of the slopes of the incoming and outgoing lines.

(ii) The minimum drop will be ≥ 0.05 feet for lines 42 inches in diameter and smaller.

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(b) Where the main flow changes direction at the manhole, the design will maintain the average of the slopes of the incoming and outgoing lines and compensate for the loss of velocity head caused by the turn.

(i) The slope component will be equal to the average of the slopes of the incoming and outgoing lines times the diameter of the manhole.

(ii) The velocity head component will be determined by the following formula:

$$h_v = K_b (v)^2 / 2g$$

where:

h_v = required drop to compensate for loss of velocity head (feet).

K_b = bend coefficient, use 0.4 for 90° turn, 0.32 for 45° turn and linear proportioning for other deflection angles (dimensions).

v = design velocity of incoming line based on design flow, ft/sec.

$g = 32 \text{ ft/sec}^2$.

(iii) The total drop required through the manhole will be the sum of the slope component and velocity head component.

(c) Where flows converge at a manhole, the inverts should be designed to produce a smooth water surface at design flow with no backwater conditions in any of the incoming lines or in the manhole. Excessive drops which cause turbulence are to be avoided.

(d) The use of drop connections to manholes (drop manholes) will require CUD approval and shall conform to Sanitary Sewer Construction Details, Sheet 1. Drop manholes are required when inflows to outflows elevations will be greater than 1.5 feet.

7. The maximum distance between manholes allowed is:

- (a) 8"-21" mains – 450'
- (b) 24" & larger – 500' for average velocities 3 fps or less
- (c) 24" & larger – 800' maximum, for average velocities greater than 3 fps.

C. LINE CRITERIA

(1) Sanitary sewer materials must comply with the requirements set forth in the Specifications shown on the Sanitary Sewer Construction Details, Sheet 1.

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(2) Minimum line size allowed: 8" inside diameter.

(3) Following are minimum slopes considered necessary in noncurvilinear lines to provide minimum allowable velocities. GREATER SLOPES THAN MINIMUM ARE DESIRABLE AND ARE TO BE PROVIDED WHERE POSSIBLE. Maximum slopes should never result in super critical flow.

SEWER LD.	MINIMUM SLOPE (ft/ft)
8"	0.0060*
10"	0.0028
12"	0.0022
15"	0.0015
18"	0.0012
21"	0.0010
24"	0.0008
27"	0.00068
30"	0.00060
36"	0.00048

* A minimum slope of 0.0040 ft/ft is acceptable for an 8" line if the design loading is at least 200 R-1 DU's or 275 R-T, R-2 or mobile home dwelling units. This slope is also acceptable when the line material is PVC.

(4) Sections of line that are flat relative to the upstream line shall be avoided. As much as possible, continuous flow velocity and capacity will be provided. The energy gradient should slope generally parallel to the slope of the invert with no abrupt changes nor slopes opposite to the direction of flow.

(5) Line depth should be sufficient to provide gravity service to property contiguous to the line. Generally, house services shall be a minimum of 5' below the top of curb at the property line as measured from the top of curb to the invert of the service line.

(6) The main lines are to be located within public right-of-way except as noted in sub-section 7, which follows, and are to be aligned in accordance with the Primary

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Utility Locations. Where the Primary Utility Locations do not apply, the following criteria shall apply:

(a) The New Mexico Environmental Department policy on the proximity of water and sewer lines: 1577148

Whenever possible, it is desirable to lay parallel water and sewer lines at least 10 feet apart horizontally, and the water line should be at a higher elevation than the sewer. If this not possible, separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 2 feet above the sewer. When water and sewer lines cross each other, the water line shall be at least 2 feet above the sewer; otherwise the sewer shall be of ductile iron pipe." A preferred alternative is encasement in concrete as shown in the Sanitary Sewer Construction Details, Sheet 1 for ten (10) foot on each side of the water line. If ductile iron pipe is used it must be run from manhole to manhole.

(b) Main lines must be located so that they can be maintained without disturbing any sidewalk, curb, gutter or any other utility. The required trench must be totally within the paved roadway.

(c) Written approval of the Department must be obtained for any deviations from the primary utility locations.

(7) Sanitary sewer lines may be located outside public right-of-way only under the following conditions:

(a) Prior written approval is given by the SFCUD director or his/her designee.

(b) The main line must be located as follows:

(i) In a paved, permanent access utility easement, or

(ii) In a utility easement within a planned green/open space with access from a street suitable for sewer line maintenance equipment.

(iii) If (1) and/or (2) above are impossible due to prior plating, the situation will be handled as a special case to be approved by the SFCUD.

(c) In a permanent utility easement granted for exclusive use of water and sanitary sewer. It must be possible to excavate any buried sanitary sewer with 1:1 side slopes from the bottom of the pipe, without disturbing any sidewalk, curb and gutter, or any other utility. The required trench must be contained within the paved roadway and/or the exclusive easement. A minimum width easement of 20' is required for lines up to 10 feet deep. Lines

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

deeper than 10 feet shall be provided with easements of a width in accordance to the following schedule:

DEPTH (H)	EASEMENT WIDTH (FT)
10-15	25
16-20	35
>20	100

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(d) Compliance with the New Mexico Environment Department policy on the proximity of water and sewer lines must be achieved.

(e) In private streets or rights-of-way, Primary Utility Locations shall apply.

D. CURVILINEAR SEWERS

Curvilinear sewers are permitted in accordance with the following criteria:

(1) The pipe length to be used, deflection angle, and radius of curvature must be stated on the plans.

(2) The maximum design deflection angle shall be 2/3 of pipe manufacturer's recommended maximum.

(3) The minimum radius of curvature is 300' based on 5.5 foot pipe lengths. If shorter lengths are available, small radii as appropriate shall be considered.

(4) The maximum distance between manholes shall be 400'.

(5) The slope of the curvilinear of the sewer must be at least 5% greater than the upstream slope straight line sewer. Additionally, the minimum slope criteria for curvilinear sewers is shown below.

SEWER I.D.	SLOPE
8"	0.0066
10"	0.0030
12"	0.0024
15"	0.0018

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(6) Generally, concrete encasement according to the Sanitary Sewer Construction Details, Sheet 1 is recommended where necessary due to proximity of water lines. If ductile iron pipe is utilized in lieu of concrete encasement, it shall run from manhole to manhole.

(7) Gravity Sewer – Minimum radius for Curvature for PVC SDR-35 pipe.

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Min. Radius of Curvature</u>	<u>Max. Offset per Length</u>
8"	13'-0"	300 ft.	3"
8"	20'-0"	300 ft.	8"
10"	13'-0"	375 ft.	2 ½"
10"	20'-0"	375 ft.	6 ½"
12"	13'-0"	450 ft.	2"
12"	20'-0"	450 ft.	6"

Diameters greater than 12", shall be designed as approved by SFCUD.

E. SERVICE CONNECTIONS (Private collection systems and individual service connections).

(1) A minimum four inch (4") service connection must be made to the main line except at the end of cul-de-sacs where connection to a manhole shall be permitted in the manner shown in the Sanitary Sewer Construction Details, Sheet 1.

(2) Six inch (6") service connections shall be permitted only where a 6" tee in the main exists.

(3) Four inch (4") and six inch (6") mechanical taps are permitted to tappable 10" main lines. Mechanical or Manufacturer's taps are required where tees are not available in existing lines. Mechanical and Manufacturer's taps shall conform to the Sanitary Sewer Construction Details.

(4) Six inch (6") service connections to 8" mains and all service connections 8" and larger shall be made by means of a manhole when there are no existing tees of the required size in the main. Insertion of a factory made tee will be permitted, if practical, for purposes of connecting 4" and 6" services to an existing 8" main. Approved coupling devices

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shall be required. Service connections to a manhole are to be made with the invert of the service at the elevation of the top of the main line. No inside-manhole piping shall be permitted.

(5) Service connection shall not be made to sewer interceptors (lines 12 inches in diameter or larger) or lines with peak flows greater than 3 MGD, regardless of size.

(6) All service connections shall be made such that the service is perpendicular or radial to the sewer main.

(7) All service connections shall have a minimum slope of 1/4" per foot toward the main within the public right-of-way. Lesser slopes may be permitted with prior approval of SFCUD, provided engineered drawings are submitted.

F. Television Inspection of Constructed Sewers

All sewer lines constructed for the SFCUD shall be television inspected. The sewerline inspection shall be on a videocassette recorder (VCR) and the tape(s) furnished to the SFCUD prior to acceptance by the County.

Section 3 ENGINEERING DESIGN STANDARDS FOR PRESSURE SEWERS

A. GENERAL CONDITIONS

(1) Systems referred to in these design standards entail high and low pressure sewer installations to serve public or privately financed developments. All pipes, fittings, pumps, pump controls, and other appurtenant components of pressure sanitary sewers shall be designed by a professional engineer registered in New Mexico, with experience in the design of pressure sanitary sewer systems.

(2) Pipe design, installation and testing shall be made in accordance with AWWA Standards applicable to water lines, applicable provisions of the Santa Fe County Code, and the New Mexico Standard Specifications for Public Works Construction

(3) Pressure sewer systems may only be used when, in the opinion of the SFCUD staff, topographic or other conditions may not allow for the operation of conventional gravity flow sewers, or when installation of such sewers may disturb existing drainage ways and/or would increase the erosion potential in existing arroyos.

(4) Prior to its design, the concept of using a pressure system must be accepted in writing by the SFCUD engineer in the form of a sanitary sewer availability statement. For the SFCUD to make a determination, the proponent of a pressure sewer shall submit the relevant information regarding the site's topography.

(5) Design documents shall include all relevant system information as required the SFCUD for its review.

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B. HIGH PRESSURE SEWERS

(1) These systems generally include a lift station(s), a pressurized discharge line (forcemain), an emergency power supply source, and all appurtenant controls and instrumentation, installed for sanitary sewage to be discharged into a gravity flow segment of the county's system.

(2) The design of lift stations, forcemains, and controls shall follow the guidelines presented in the manual of Practice (MOP) No. FD-4, Facilities Development, of the Water Environment Federation.

(3) Complete construction documents for this type of facility, shall include a design memorandum, specifications, and drawings for pumps, piping, instrumentation, alarms and telemetry. All parts shall be, in the opinion of the SFCUD, fully compatible with the county's existing system.

C. LOW PRESSURE SEWERS

(1) Low pressure sewers may constitute a very viable alternative to gravity flow collection lines. These systems will generally include individual on-site grinder pump stations discharging a finely ground slurry into small diameter, low pressure (60 psig or less) mains located within appropriate public utility easements or rights of way. Under certain conditions, it may also be desirable to use grinder pump stations which discharge into gravity flow sewer lines.

(2) Complete construction documents shall include the design memorandum, specifications and drawings for the entire system or network, from the grinder pump to the ultimate point of discharge into the gravity sewer. All parts shall be, in the opinion of the SFCUD, compatible with the county's existing system.

(3) Pump stations shall be designed as a package, complete with wet well, and appurtenant instrumentation and controls, fully compatible with the county's existing systems. Each station shall service no more than one individual legal lot.

(4) Individual grinder pump stations for residential service shall be designed to perform their grinding and pumping functions using no more than one (1) horsepower. The electric power for the installation shall be derived from the same source that serves the building and not a separate one. A grinding pump station shall serve no more than one residential lot.

(5) Placement of the grinder pump station shall be outdoors, in location of easy access for maintenance personnel. Wet well shall be provided with integral accessways.

(6) Low pressure collection system shall be designed as branched networks without loops, and as few as possible abrupt directional changes.

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

(7) Pipes and appurtenant fittings shall be designed to be installed and tested in accordance with AWWA Standards applicable to water systems.

(8) Design shall protect the county system from potential odor problems associated with low pressure sewer discharge.

D. EQUIPMENT MANUFACTURER LIST

1577153

(1) The county shall maintain an up-to-date list of pre-qualified manufacturers for lift and grinder pump stations, as well as electrical and instrumentation equipment.

(2) This list shall be updated not less often than once every two years. Proposed revisions to the list shall be submitted by a professional engineer for review by the SFCUD. Proposals shall include the rationale for the recommended revision(s).

PUBLIC UTILITIES WATER AND WASTEWATER

Santa Fe County Utilities Department	SANTA FE, NEW MEXICO					
SANITARY SEWER CONSTRUCTION DETAILS						
DATE	BY	CHECKED BY	DATE	SCALE	NO.	
10/13/88	JH	JH	10/13/88	1"	1	