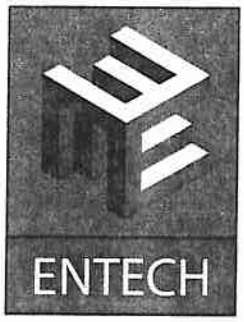
COLLEGE TOWNSHIP WATER AUTHORITY

College Township Building
1481 East College Avenue
State College, Pennsylvania 16801

STANDARD SPECIFICATIONS
for
WATER MAIN INSTALLATION



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STANDARD SPECIFICATIONS
for
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WATER MAIN INSTALLATION CONSTRUCTION DETAILS

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GENERAL REQUIREMENTS

SECTION 01010 - INTRODUCTION

PART 1 - GENERAL

1.1 SCOPE

A. These Specifications have been adopted by the College Township Water Authority (Authority) to specify the manner in which water mains and appurtenances shall be furnished and installed by the Contractor within the College Township Water Authority service area.

B. The Contractor shall comply with all regulations and requirements of the College Township Water Authority as established in the Authority's Rules and Regulations, these Specifications, and College Township ordinances, plus applicable regulations of the Pennsylvania Department of Environmental Protection, and where applicable, all other Federal, State and Regulatory Agencies.

C. Prior to beginning any work or requesting an Authority review of any submitted plan, drawing, or sketch, the Contractor shall post with the Authority an application and an initial escrow to cover engineering, legal, and Authority administrative costs prior to the development of a Water Main Extension Agreement. Depending on the size and complexity of the proposed water facilities, additional Escrows will be required prior to formal plan review and approval. The final plan approval will include an estimate of construction, inspection, and contingency costs, which amount shall be placed in Escrow prior to construction.

D. Before any work is started at the construction site, the Contractor shall notify the Authority, the local Police Department, Township Public Works Department, local Fire Department, the School District, and the various utility companies serving the Authority and shall schedule a preconstruction meeting with the Authority and the Engineer. At the preconstruction meeting, the escrow amount may be modified as necessary to cover construction and inspection costs based on a bona fide construction proposal.

E. It shall be understood that the Authority, at their discretion, reserves the right to visit the construction site(s) and inspect the installation of the water mains and require corrective actions to assure compliance with these Standards.

F. All work is subject to the inspection and final acceptance by the Authority's Engineer or designated representatives.

G. All materials and workmanship must meet or exceed PennDOT Publication 408.

1.2 DEFINITIONS

A. See the Authority's Rules and Regulations.

1.3 INSTALLATION OF WATER MAINS

A. All water mains shall be installed in accordance with the Standard Specifications of the Authority.

B. The layout and alignment of all water mains shall be reviewed and approved by the Authority or the Engineer.

C. All water mains and fittings shall be D.I. pipe manufactured and installed in accordance with these Specifications. The pipe shall not be less than 8-inches, with the possible exception of deadends, where the pipe may be 6-inches in size. Allowance for 6-inch lines on deadends shall be at the discretion of the Authority or the Engineer.

D. All water mains shall be laid with a minimum depth of cover of 4 feet, properly bedded, backfilled, blocked, subjected to a hydrostatic test for leakage in accordance with these Specifications.

E. Deadends shall be minimized by looping all mains whenever practical. Where deadends are necessary, the line shall terminate with a gate valve as the same diameter as the main and a flushing device. A fire hydrant is the preferred flushing device, while blowoffs are permissible at the discretion of the Authority or the Engineer.

1.4 INSTALLATION OF SERVICE LINES

A. General: The service line extending from the curb stop to the premises shall be installed by the customer and subject to the detailed requirements and Standard Specifications of the Authority.

B. Meter Pits: Meter pits may be required on all service line extensions of 200 feet in length or greater at the discretion of the Authority. The meter pit shall be in complete accordance with the Standard Specifications of the Authority with respect to such work. All pipe passing through foundation or bearing walls shall be provided with suitable wrought iron sleeves and the annular space between the sleeve and the pipe made watertight.

C. Inspection: The Authority shall be notified when the installation of the service line is completed and prior to backfilling, so that the service line can be tested in the presence of a representative of the Authority and an inspection made of both workmanship and materials. The notice shall include such data as the location, the name of the owner and tenant and the time the work will be ready for inspection.

Water will not be supplied through the service line or any related part thereof or through any service or supply line which has not been inspected in the open trench and approved by the Authority. These requirements apply to both original installation and repairs.

PART 2 - REQUIREMENTS

2.1 DOCUMENTS TO BE SUBMITTED TO OBTAIN INITIAL PLAN APPROVAL

A. The Contractor shall, in order to obtain initial approval of plans, submit his proposed plans and data to the Authority with sufficient information to enable the Authority's Engineer and Solicitor to review same for compliance with sound engineering practices and legal requirements and all Authority rules and regulations and these Standard Specifications. The Authority's review of the Contractor's plans is for the purpose of determining general conformance with the Authority's Standard Specifications, requirements and details of the Authority. The Contractor remains responsible for implementation of the Authority' Specifications, requirements and details. The Contractor is also responsible for the

accuracy of the Accepted Plans and for the designed facility to function as intended. The Contractor is also responsible for determining the size and location of all existing utilities. The Contractor is hereby notified that any purchase of material and/or equipment etc., prior to the Authority's approval thereof, is at the Contractors risk.

B. When the Authority, through its Engineer, indicates its general acceptance of the proposed plans, the Contractor shall provide an estimate of the construction of the proposed facilities in sufficient detail for the Authority's Engineer to establish an escrow amount for the proposed work. Standard estimating procedure shall be used. In general, water main installation shall be classified by linear footage and pipe size for estimating. An estimate for rock excavation shall also be included. It is preferred that the estimate be done by the Contractor competent in the work to be performed. The Authority's Engineer will have the right to adjust the estimate to reflect his understanding of the cost to perform this work.

2.2 SUBMITTALS AFTER PLAN APPROVAL

A. Upon general acceptance of the proposed plans, but prior to initiating any work, the Contractor shall submit copies of all required permits and other various requirements as itemized herein.

B. All submittals shall be made in accordance with Section 01300 - Submittals of these Specifications.

C. The Contractor shall, in accordance with the following schedule, transmit to the Authority, two (2) copies or sets of the following data, unless otherwise noted.

1. Two (2) weeks prior to construction:

   a. Three (3) sets of the Accepted Plans signed and sealed by a Professional Engineer licensed to practice in the Commonwealth of Pennsylvania. The drawings shall be clear and legible. The plans prepared utilizing AutoCAD shall be prepared at a scale of not less than 1 inch equals 50 feet. Each drawing shall contain a North arrow. Each drawing shall name the legal Owner of the land on which the construction is to occur and the legal name of the Contractor.
   b. Pennsylvania State Highway Occupancy Permit (when required).
   c. County Highway Occupancy Permit (when required).
   d. Township Road Opening Permit (when required).
   e. Railroad Permit (when required).
   f. Erosion and Sediment Control Plan.
   g. Any and all other permits that may be required to undertake the installation of the water facilities.
   h. Executed easements or rights-of-way obtained from private landowners (when required) to be conveyed to the Authority upon acceptance of the completed facilities.
   i. Shop Drawings of the following:
      (See Section 01300, Submittals for copies required).

      (1) Pipe
      (2) Fittings
      (3) Valves
      (4) Valve Boxes
      (5) Fire Hydrants

(6) Laterals
(7) All other appurtenant data

j. Blasting Report, if required.

2. During construction:

a. Letters of certification as to compliance with the Specifications for:

(1) Paving material
(2) Select backfill - Type No. 2A (PennDOT)
(3) Concrete

3. After construction:

a. Blasting Records
b. Record Drawings
c. Warranties and Guarantees shall be turned over to the Authority
d. A Maintenance Bond equal to fifteen percent (15%) of the construction cost of the proposed work or five thousand dollars ($5,000.00) whichever is greater is required. The Contractor shall also purchase and maintain such insurance as will protect the Authority from any claims. The said insurance shall be as required under the laws of Pennsylvania.

2.3 ROCK EXCAVATION

A. Contractor shall obtain approval from the Township prior to any blasting. All blasting shall be performed under the supervision of a Professional Engineer licensed to practice in the Commonwealth of Pennsylvania.

2.4 SOILS TESTING

A. All soils testing as described in these Specifications shall be performed by a reputable testing and control firm when required by the Authority.

2.5 SERVICE LINES

A. Service connections are to be installed from the water main to the street right-of-way line in accordance with these Specifications. Service lines installed from the street right-of-way line to the building shall be installed in accordance with these Specifications.

2.6 ACCESS TO WORK

A. Representatives of the Authority shall have access to the work. The Contractor shall provide proper and safe facilities for such access and observation of the work and also for any inspection or testing thereof by others.

2.7 AUTHORITY MAY STOP THE WORK

A. If the work is defective, or the Contractor fails to supply suitable materials, the Authority may order the Contractor to stop the work, or any portion thereof, until the cause for such order has been eliminated.

2.8 WARRANTY AND GUARANTEE

A. The Contractor warrants and guarantees to the Authority that all work will be of good quality and free from faults or defects. All unsatisfactory work, all faulty or defective work, and all work not conforming to the Accepted Plans and these Specifications shall be considered defective. The Authority will give timely notice of all defects to Contractor. At the option of the Authority, all defective work, whether or not in place, may be rejected or accepted with or without requiring corrections from Contractor.

2.9 TESTS AND INSPECTIONS

A. Where so indicated in these Specifications, or if the laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, require any work to specifically be inspected, tested, or approved by some public body, the Contractor shall assume full responsibility thereof, pay all cost in connection therewith, and furnish the Authority the required certificates of inspection, testing, or approval.

B. The Contractor shall give timely notice of readiness of the work for all inspections or approvals.

2.10 FINAL INSPECTION

A. Upon written notice from the Contractor that the project is complete, the Authority will make a final inspection with the Contractor and will notify the Contractor in writing of all particulars in which this inspection reveals that the work is incomplete or defective. The Contractor shall take such measures as are necessary to remedy such deficiencies.

2.11 FINAL APPLICATION FOR ACCEPTANCE

A. After the Contractor has completed all such corrections to the satisfaction of the Authority, and delivered all schedules, guarantees, bonds, certificates of inspection, and other documents, the Authority shall issue a letter of final acceptance.

2.12 EIGHTEEN-MONTH CORRECTION PERIOD

A. If after final inspection and prior to the expiration of the eighteen-month (18) Maintenance Bond or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Authority, any work installed by the Contractor is found to be defective, Contractor shall promptly, in accordance with the Authority's written instructions, either correct such defective work, or, if it has been rejected by the Authority, remove it from the site and replace it with non-defective . If Contractor does not promptly comply with the terms of such instructions, the Authority may have the defective corrected or the rejected removed and replaced, and all direct and indirect costs of such

removal and replacement, including compensation of additional professional services shall be paid by the Contractor.

2.13 RECORD DRAWINGS

A. At completion of the project, Contractor shall provide the Authority with two (2) sets of reproducible plans (mylars), in a neat and clean condition showing the "As-Built Conditions."

B. Plans shall be marked "Record Drawings" and maintained at the project site. The Contractor shall record on the prints all deviations from his Accepted Plans and these Specifications, at the time that such deviations are made.

1. Record Drawings for water mains shall show all vertical and horizontal changes to the water main as shown on the Accepted Plans. The location of all service laterals (lengths and depths) shall be dimensional from the main. Record Drawings shall indicate a profile showing the depths where rock was encountered and all other changes made to his Accepted Plans and these Specifications.

C. A complete file of accepted field sketches, diagrams, and other changes as may become necessary during the progress of the work shall also be maintained and attached to the set of marked-up prints.

D. At completion of the work, the Contractor shall provide, for the information of the Authority, each sheet of marked prints and all accepted field sketches and diagrams.

E. When this data has been reviewed and returned by the Authority, the Contractor shall record all field changes and conditions on the Record Drawings clearly noting all field changes and conditions and providing plots on reproducible mylars. Each sheet shall be clearly marked "Record Drawing" and shall be signed by an office of the company of the Contractor certifying that each sheet/drawing reflect the actual as-built conditions.

F. Provide one (1) set of bluelines in addition to the mylar Record Drawings. Deliver mylars and bluelines to the Authority.

END OF SECTION 01010

SECTION 01030 - LOCATIONS OF EXISTING LINES

PART 1 - GENERAL

1.1 SCOPE

A. Construction Requirements:

1. In accordance with the Commonwealth of Pennsylvania Act No. 38 of 1991, PA One Call System, 1-800-242-1776, the Contractor, prior to performing excavation or demolition work on the job site shall obtain all recorded locations of existing lines as outlined herein.
2. Attention is directed to the fact that there may be other lines in certain locations in addition to the recorded locations.

B. Related Requirements Specified Elsewhere:

1. Act No. 38
2. Excavation, Section 02224 - Trenching, Bedding, and Backfilling

1.2 SUBMITTALS

A. The Contractor shall furnish the Authority a certification listing the names of the Users whom he has contacted prior to starting his work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. It is the duty of the Contractor, prior to performing excavation or demolition work at his site within a political subdivision, to ascertain the exact location and type of Users' lines which are located within the limits of his work area.

3.2 OBTAINING LOCATION OF EXISTING USERS' LINES

A. The Contractor shall obtain the list of Users from the Recorder of Deeds of the County in which the work is being performed.

B. Not less than three (3) working days prior to the day the excavation or demolition work shall begin, the Contractor shall request that each of the Users with facilities within the limits of his work area locate these facilities in the field. Generally, this will include determining and locating the number and horizontal position of all lines. (Also see Paragraph 3.3 of this Section, "Locating Lines.")

C. The following are cooperative steps which the Contractor shall take, either at or off the excavation or demolition site:

1. Before the Contractor starts any demolition work in the area of a particular User's line, the Contractor shall ascertain from the User if the User wants to have a representative present during the work within this area. Additionally, the Contractor shall comply with all standard regulations and necessary precautions as may be required by the User.

2. Inform each operator, employed by him at the site of such work, of the information obtained by him as noted above.

3. Report immediately to the User any break or leak on its lines, or dent, gouge, groove, or other damage to such lines or to their coating or cathodic protection, made or discovered in the course of the excavation or demolition work.

4. Alert immediately the occupants of premises as to any emergency that he may create or discover at or near such premises.

5. The requirements of paragraphs A, B, and C above apply to a User or Contractor performing excavation or demolition work in an emergency.

3.3 LOCATING LINES

A. All recorded or unrecorded lines shall be located on the ground with pipe-locating equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or marked stakes in the ground. Such locations shall be established at least 50 feet in advance of all trench excavation. All such location work shall be provided by the Contractor to the satisfaction of the Authority.

END OF SECTION 01030

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 SCHEDULES

A. Before any work is started at the job site, the Contractor shall submit to the Authority's Engineer Shop Drawings in accordance with the following requirements.

B. The Contractor shall be responsible for preparing a Progress or Work Schedule for the entire project.

1.2 SHOP DRAWINGS AND SAMPLES

A. The Contractor shall process the Shop Drawings required by his work to the Authority's Engineer and he shall be responsible for their timely submission in accordance with the Shop Drawing Schedule which is included in the overall Progress or Work Schedule as described in Part 2 of this Section.

B. Revised Shop Drawings submitted for review shall be marked "RESUBMISSION."

PART 2 - SCHEDULE

2.1 PREPARATION

A. The Contractor shall prepare a Progress or Work Schedule for the entire project for any work anticipated to last longer than four weeks.

B. Each activity in the Progress or Work Schedule shall be identified and a time for the performance of such activity indicated. Each activity shall be preceded by all work that must be accomplished prior to that activity. All abbreviations, codes, and/or symbols used shall be described on the Schedule.

2.2 SUBMISSION

A. Submit three (3) copies of Schedule to the Authority for review within ten (10) days prior to starting construction. Update and resubmit Schedule monthly thereafter until completion of the work. Updated Schedule shall have completed activities removed or indicated as such. Whenever modifications are made to the project which add or delete activities and/or revise time of completion, Schedule shall be revised and resubmitted to the Authority within ten (10) days after such modification is authorized. When a Schedule is resubmitted to the Authority, the Contractor shall specifically indicate why the Schedule is being resubmitted.

PART 3 - SHOP DRAWINGS

3.1 GENERAL

A. Shop Drawings are defined as drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the work shall be fabricated and/or installed.

B. Shop Drawings are a supplementary means of communications to assist in the understanding of what the Contractor is providing and doing, and that whatever he puts in speaks for itself and either meets or does not meet the Accepted Plans and Specifications.

C. In the instance of a substituted item, the Contractor shall verify that it will fit into the space allocated to the originally required item giving due to all other trades' requirements. Where modifications to the Accepted Plans and Specifications are proposed, the Contractor must indicate such deviation in writing in his submittal.

3.2 SUBMITTAL PROCEDURES

A. All Shop Drawings shall be delivered to the Authority or the representative of the Authority on the project site.

B. The Authority's Engineer will screen Shop Drawing submittals to ensure that the Shop Drawings have been properly certified and identified. If they are submitted properly, he will review the items.

3.3 CATALOG SHEETS

A. For standard manufactured items considered by the Authority as not requiring special Shop Drawings, the Contractor shall submit three (3) copies of manufacturer's catalog sheets showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, wiring and control diagrams, and all other pertinent information.

B. The Authority/Authority's Engineer will retain two (2) copies and return remainder to the Contractor.

3.4 SHOP DRAWINGS

A. The Contractor will submit for review three (3) white prints of Shop and Working Drawings of fabricated equipment and materials for which such drawings are specifically requested.

B. Prior to submitting drawings to the Authority's Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter conforms to the Accepted Plans and Specifications in all respects. Drawings which are correct shall be marked with the date, checker's name, and certification of the Contractor's approval, and then shall be submitted to the Authority. Any Shop Drawings submitted without the Contractor's certification, will be returned without review.

C. The Authority/Authority's Engineer will retain two (2) copies and return remainder to the Contractor.

D. Shop Drawings shall show the principal dimensions, weight, structural and operating features, performance characteristics and wiring diagrams, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct.

E. When so specified or if considered by the Authority to be acceptable, manufacturer's Specifications, catalog data, descriptive matter, illustrations, etc., may be submitted for review in place of Shop and Working Drawings. In such case the requirements shall be as specified for Shop and Working Drawings, insofar as applicable.

F. The Contractor shall be responsible for the prompt submission of all Shop and Working Drawings in accordance with the Shop Drawing Schedule so that there shall be no delay to the work due to the absence of such drawings.

G. No material shall be purchased or fabricated until the required Shop and Working Drawings have been submitted and reviewed. All materials and work involved in the construction shall then be as represented by said drawings.

H. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by his Subcontractors and vendors. Prior to submitting drawings to the Authority, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the drawings and Specifications in all respects. Drawings which are correct shall be marked with the date, checker's name and indication of the Contractor's approval, and then shall be submitted to the Authority; other drawings shall be returned for correction.

I. The Authority's review of Shop and Working Drawings will follow a general check made to ascertain conformance with the design concept and functional result of the project and compliance with the information given in the Accepted Plans and Specifications. The Contractor is responsible for: details and accuracy; conforming and correlating all quantities and dimensions at the job site; information that pertains solely to the fabrication processes or to techniques of construction; and coordination of the work of all trades.

3.5 FIELD DISTRIBUTION

A. The Contractor shall be responsible for the required number of processed drawings or catalog cuts for field distribution.

B. The Contractor shall be responsible for the prompt distribution of processed Shop Drawings.

C. The Contractor shall have the overall responsibility for coordinating the necessary information to properly coordinate the work.

PART 4 - SAMPLES

4.1 SUBMISSION OF SAMPLES

A. When specified, the Contractor shall provide samples in duplicate and identify each sample by an appropriate tag or label listing the names of the project, the Contractor and/or Subcontractor as well as the exact identification of the sample. Tag or label shall be large enough to provide a blank space for review stamps.

B. Samples of items submitted for destruction tests or for use in testing mixture with other materials, will not be returned. Review of these items will be given by letter.

C. When reviewed, one sample of each item, not submitted for destruction, will be returned to the Contractor and shall be kept and maintained in good condition in the submitting Contractor's office at the project site for later use in comparison with material actually delivered for the work. When samples of large fabricated items or of costly items are required, reviewed samples may be installed in the work if the exact location of such samples is recorded on the Authority's set of Accepted Plans.

PART 5 - CERTIFICATIONS AND TESTS

5.1 GENERAL

A. Two (2) copies of certifications and reports of tests when required under the various Sections of the Specifications, shall be submitted to the Authority.

PART 6 - CONSTRUCTION PHOTOGRAPHS

6.1 GENERAL

A. The Contractor shall provide clear, sharp, black and white progress photographs monthly, starting when the work begins and continuing as long as the work is in progress. Color photographs shall be made of the completed project; views as requested by the Authority.

6.2 NUMBER OF VIEWS

A. The number of views required shall be from three to six, depending on the progress of work. Views shall be provided of the general construction area before any work begins. Photographs shall be 8" x 10" in size and shall be submitted in duplicate.

6.3 VIDEOTAPING

A. When the Contractor anticipates blasting, a pre-blasting, narrated videotape shall be prepared describing and showing the condition of adjoining and nearby sidewalks, curbs, roadways, foundations, other utilities, and structures which may be damaged as a result of the blasting. The videotape shall be submitted to the Authority prior to commencing work.

PART 7 - RECORD DOCUMENT SUBMITTALS

7.1 GENERAL

A. Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Engineer's reference during normal working hours.

B. Record drawings shall be prepared in accordance with Section 01010-Introduction, paragraph 2.13.

7.2 RECORD DRAWINGS

A. Maintain a clean, undamaged set of blue- or black-line white prints of Accepted Plans and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Accepted Plans. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the work.

2. Mark new information that is important to the Authority but was not shown on Accepted Plans or Shop Drawings (i.e. location, type and depth of adjacent or crossing utilities such as gas, electric, sewer, storm water, telephone, etc.)

3. Note related change order numbers where applicable.

4. Organize Record Drawing sheets into manageable sets. Bind sets with durable paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

5. Upon completion of the work, submit Record Drawings to the Engineer for review prior to revising the Record Drawing mylars and blueline prints required by the Contractor's Agreement.

END OF SECTION 01300

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor is referred to conditions and requirements given in various Sections of the Specifications.

1.2 OCCUPYING PRIVATE LAND

A. Written consent from the proper parties shall be obtained by the Contractor to enter or occupy with men, tools, materials or equipment any land other than his property for any purpose related to his performance of the work.

1.3 PROTECTION OF EXISTING UTILITIES

A. The Contractor shall conduct his operations and take all special precautions necessary to protect equipment, utility lines, roadways and subsurface, submerged and overhead facilities which are to remain in place and undisturbed by his operations. The Contractor shall immediately notify the Owner of the facilities or areas which are disturbed, damaged or injured as a result of the Contractor's operations, and determine the proper method of replacing or repairing the affected facilities at least to the conditions which existed prior to the Contractor's operations. The Contractor shall, at his own expense, replace, repair or restore the affected facilities or areas to their original condition or shall reimburse the Owner of said facilities or areas for such expenses as the said Owner may accrue in performing the work.

1.4 STORAGE AND PROTECTION OF MATERIALS

A. Materials stored in the open at the project site shall be stored on planks or other dunnage as necessary to keep materials from contact with the ground and shall be covered with tarpaulins for protection from weather.

B. Care shall be exercised in the installation of material to avoid damage or disfiguration of any kind. All equipment shall be protected from dust and moisture prior to and after installation.

C. Failure of the Contractor to protect material furnished by him, as outlined herein, shall be grounds for rejection of the material.

1.5 INTERFERENCE WITH/AND PROTECTION OF STREETS

A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefore from the proper authorities including PennDOT, Centre County Emergency Preparedness, the School District, PA State Police, and College Township, as appropriate. If any street or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Authority.

B. Streets, roads, private ways and walks not closed shall be maintained passable by the Contractor at his expense and the Contractor shall assume full responsibility for the adequacy and safety of provisions made.

C. The Contractor shall, no less than 24 and preferably 48 hours in advance of closing any street, notify the Township Police, Centre County Emergency Communication Center, and School Districts in writing, with a copy to the Authority. He shall cooperate with the Police Department in the establishment of alternate routes and, at his expense, shall provide adequate, plainly marked detour signs.

D. For control of moderate traffic, the Contractor shall provide an adequate number of flagmen or uniformed special officers.

E. Whenever and wherever traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by his construction operations. Such officers shall be in addition to the watchmen required. Traffic control shall be in accordance with PennDOT Publication 203, Work Zone Traffic Control.

1.6 SAFETY PRECAUTIONS

A. Until final acceptance of the work, the Contractor shall continuously maintain adequate protection of the work and work in progress from damage. He shall adequately protect adjacent private and public property as provided by law and these Specifications.

B. The Contractor shall take all necessary precautions for the safety of employees doing the work, and shall comply with all applicable provisions of federal, state, and local safety laws and building codes to prevent accidents or injury to person on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times as required by the conditions and progress of the work, all necessary safeguards and barricades for the protection of the work, all necessary safeguards and barricades for the protection of employees on the work and the safety of others employed near the work and public, and shall post danger signs and warning lights warning against the hazards created by such features of the construction as protruding nails, hoists, excavations, scaffolding, stairways and falling materials.

He shall designate a responsible member of its organization on the work, whose duty shall be the prevention of accidents. The name and position of the person so designated shall be reported in writing to the Authority.

C. The Contractor shall immediately report in writing, giving full details, to the Authority all serious accidents which arise out of or in connection with the performance of the work, whether on or adjacent to the site, which cause death, serious personal injury or substantial property damage. In addition, if death or serious injury or substantial property damage is caused, the accident shall be reported immediately by telephone or messenger to the Authority. If a claim is made or suit is filed by anyone against the Contractor, or any Subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Authority, giving full details of the claim.

D. The Contractor shall assume all risks of loss or damage of any kind to any vehicles, machinery, equipment, materials or supplies which it shall provide in doing the work.

E. The Contractor shall adequately protect property owned by others from damage by the construction operations.

1.7 DUST AND LITTER CONTROL

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation and dispersion of dust, litter, and other debris. Proper containers for litter shall be provided, and they shall be emptied when full.

1.8 SANITARY

A. The Contractor shall provide, maintain, and remove when no longer required, an adequate number of temporary, prefabricated, chemical-type toilets with proper enclosures for the use of workmen during construction. When connected to water and sewer, meet all code requirements and take precautions to prevent freezing.

B. Keep toilets clean and supplied with toilet paper at all times. Comply with all local and state health requirements and sanitary regulations.

1.9 HEAT

A. At all times during the placing, curing and setting of concrete, provide sufficient heat to ensure heating of spaces involved to not less than 40 degrees F.

END OF SECTION 01500

DIVISION 02
SITEWORK

SECTION 02052 - WATER MAIN REMOVAL/ABANDONMENT

PART 1 - GENERAL

1.1 COORDINATION

A. Coordinate water main isolation, removal, abandonment in place, and installation activities under the work of this contract with Subcontractors, the Authority's Engineer and the Authority at project meetings prior to the start of construction.

B. Work of this project shall be coordinated to minimize customer service down time and to minimize disruption to vehicular traffic.

C. Maximum allowable time for any water service disruption shall be eight (8) hours.

D. Notify Authority four (4) days in advance of planned service interruptions and verify that the Authority has issued "Service Interruption Notices" to each customer a minimum of two (2) days prior to disrupting water service.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with the requirements of the Commonwealth of Pennsylvania Act 38, One Call System 1-800-242-1776, in order to locate utilities prior to excavation.

B. Verify distribution valves needed to isolate mains and coordinate activities in order to have existing distribution valves operated by Authority personnel.

C. Contractor personnel may not operate existing distribution, blow-off valves, or hydrants.

3.2 SUPERVISION

A. Responsible Contractor's personnel shall supervise isolation, removal, abandonment, and installation procedures for compliance with safety precautions, specified requirements, and authorities having jurisdiction.

3.3 WATER MAIN PROCEDURE

A. Isolate water main at shut-off valves and at each curb stop (to be operated by Authority personnel).

B. Excavate at one end of the main to be removed, cut the main at the appropriate location, drain the main while venting at fire hydrants, and pump drainage to locations as approved by authorities having jurisdiction.

C. Abandon mains in place where directed on the Accepted Plans.

D. For abandoned mains, remove a section of pipe from either end such that adequate space is provided in order to connect the new main to the end of the existing "live" main. Cap off the open ends of the abandoned mains with concrete or provide M.J. cap to ensure that bedding and backfill material will not settle into the pipe.

E. Remove water main sections as specified and as shown on the Accepted Plans and dispose of in an appropriate manner.

END OF SECTION 02052

SECTION 02224 - TRENCHING, BEDDING, AND BACKFILLING

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-1, W-2, and W-3.

1.2 GENERAL

A. This work is related to Water Main Installation.

B. Perform work in accordance with OSHA, state, and local authorities having jurisdiction.

C. Verify field measurements and conditions.

PART 2 - PRODUCTS

2.1 BEDDING AND BACKFILL MATERIALS

A. Coarse Aggregate: Crushed stone PennDOT number 2A, graded in accordance with PennDOT Publication 408, Latest Edition.

B. Coarse Aggregate: Crushed stone PennDOT number 2RC, graded in accordance with PennDOT Publication 408, Latest Edition.

C. Soil Material (Type B Backfill): In accordance with PennDOT Publication 408, Latest Edition, Section 206.2.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, inverts, contours, and datums.

B. Locate existing underground, aboveground, and aerial utilities and services and verify conditions at the site. Stake and flag or otherwise mark locations.

C. Coordinate with utility companies and municipalities to locate underground utilities and services.

D. Protect above and below grade utilities and services which are to remain.

E. Protect bench marks, existing structures, fences, sidewalks, paving, curbs, and parking areas which are to remain.

F. Verify that piping, valves, and appurtenances will be installed in accordance with the manufacturer's instructions.

G. Clean excavations of unacceptable backfill materials, refuse, and debris before placing bedding or backfill.

3.2 TRENCHING

A. Open bituminous paving by cutting neat straight lines. Concrete pavement shall be opened by saw cutting.

B. Cut trench for water main a minimum of 12 inches wider than the diameter of the pipe.

C. Cut trench for service laterals a minimum of 12 inches wider than the diameter of the tubing.

D. Cut trench bottom flat and at the proper elevation for pipe bedding and a minimum of 4 feet of cover.

E. Sufficient room shall be provided at the ends of the pipe and fittings to connect joints, inspect joints and valves, and to apply protective coatings as required as indicated in other Sections of this Specification.

F. At all points where the outside diameter of the pipe is greater than the barrel diameter, such as for Dresser couplings or pipe bells, the trenching shall be increased to provide working space.

G. Hand trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock.

I. Correct over-excavated areas at no cost to the Authority.

J. Correct unauthorized excavation at no cost to the Authority.

K. When rock is encountered the trench shall be excavated to a sufficient depth to allow a 6-inch coarse aggregate PennDOT 2A bedding below the lowest point of the joints.

L. Notify the Engineer and the Authority of unexpected subsurface conditions and discontinue affected work in this area until notified to resume work.

M. Install piping promptly after trenching. Keep trenches open as short a time as possible.

3.3 PROTECTION

A. Protect utilities, pipes, conduits, poles, manholes, trees and shrubs designated to remain, and all other structures from damage during excavation. The Contractor will assume all expenses from damage to adjacent property.

B. Notify the Engineer when unexpected utilities are encountered during excavation.

C. Utilities shall be removed or relocated only as indicated on the Accepted Plans.

D. Grade top perimeter of trench to prevent surface water from draining into the excavation.

E. Maintain excavations free of water. Nearby gutters, sewers, drains, and ditches shall remain open to accommodate surface drainage.

F. Provide pumping systems, filters, drains, well points, and other devices as required to remove water from excavations. Pump water from excavations to a location approved by DEP, county conservation district, state and local authorities, and municipalities.

G. Protect the bottom of excavations and adjacent soil from freezing.

H. Provide barriers around trenches.

3.4 SHORING

A. Provide shoring, bracing, and structural work as required in accordance with authorities having jurisdiction. Protect adjacent structures, utilities, services, manholes, sidewalks, paving, and curbs.

B. Shore trenches when needed to avoid personal injury.

C. Remove shoring located above the centerline of the pipe during backfilling.

D. Maintain a sufficient quantity of timber, plank, steel, and connectors for unexpected shoring at all times during excavation.

E. Temporary shoring shall be provided.

3.5 MATERIAL REMOVAL

A. Remove pavement, road surface, curbing, and sidewalk within the lines of excavation from the site. Break up concrete and macadam for removal.

B. Remove excavated material from the site as soon as possible. Temporarily pile excavated material only where permitted by the Engineer. Remove all excavated material daily.

C. Haul materials to be removed from the site to an acceptable disposal location.

3.6 BEDDING

A. Backfill the flat bottomed trench with a coarse aggregate PennDOT 2A.

B. Bedding shall be 6-inch-thick for mains and 3-inch-thick for service laterals.

C. Form depressions for bells and couplings.

3.7 SPECIAL BEDDING

A. Concrete Cradle and Concrete Encasement: If concrete cradle and/or encasement is indicated on the Accepted Plans or required by the Engineer, the trench shall be excavated to a depth of 6 inches below the outside of the pipe barrel. All of this excavation may be done by machine.

B. Unstable Subgrade: Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, and type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, which, in the opinion of the Engineer, should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth recommended by the Engineer.

1. Before pipe is laid, the subgrade shall be made by backfilling with aggregate material, as directed by the Engineer, in 6-inch (compacted thickness) layers thoroughly tamped and the bedding prepared as specified herein.

3.8 AGGREGATE BACKFILL

A. After placement of the piping and/or valves, place and compact backfill in continuous layers not exceeding 8-inch compacted depth.

B. Compact backfill using equipment which will not displace or damage pipe or adjacent construction.

C. Material for backfill from the top of the bedding to the bottom of the existing pavement or macadam sub-base, shall be PennDOT number 2A aggregate.

D. Compact backfill during each 8-inch lift to a minimum of ninety-five percent (95%) of the dry weight density.

E. Remove surplus backfill materials from the site.

3.9 SOIL BACKFILL

A. Compact backfill using equipment which will not displace or damage pipe or adjacent construction.

B. Material for backfill of grass, field, or wooded areas shall be in accordance with PennDOT Publication 408, Section 206.2, Material (Type B). Said material shall be placed and compacted in accordance with PennDOT Publication 408, Section 601.3(e), Backfilling Trench.

C. In areas other than pavement or macadam, the top 6 inches of backfill shall be topsoil, unless noted otherwise.

D. Remove surplus backfill materials from the site.

3.10 RESTORATION

A. Restore surfaces disturbed by the work to their original condition and in accordance with state, local, and municipal authorities.

B. Subsequent settlement of backfill shall be refilled and the surface shall be brought back to grade.

3.11 SEEDING

A. A minimum of 6" of topsoil shall be spread on all disturbed areas.

B. Provide grass seed mixture of Kentucky Blue Grass, Fescue and Annual Rye to match adjacent areas.

C. Provide fertilizer and herbicide to facilitate growth.

D. Provide water, weed, cut, and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of Perennial grasses.

3.12 FIELD QUALITY CONTROL

A. The Authority retains the right to have compacted backfill tested for conformance to the requirements of the Specification.

B. Compaction tests which pass (minimum ninety-five percent (95%) of the dry weight density) shall be at the expense of the Authority.

C. Compaction tests which do not pass will be at the Contractor's expense. Unsatisfactory backfill shall be recompacted and retested at no cost to the Authority.

END OF SECTION 02224

SECTION 02513 - BITUMINOUS PAVING

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Detail W-1.

1.2 REGULATORY REQUIREMENTS

A. Conform to PennDOT Specifications Publication 408, Latest Edition, or respective Township codes and ordinances, as applicable.

B. Comply fully with all PennDOT permits where required.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bituminous Concrete Base Course: In accordance with Section 305 of PennDOT Publication 408, Latest Edition.

B. Bituminous Tack Coat: In accordance with Section 460 of PennDOT Publication 408, Latest Edition.

C. Bituminous Wearing Course: In accordance with PennDOT ID-2 Section 420 of PennDOT Publication 408, Latest Edition.

D. Fine Aggregate: Natural or manufactured sand in accordance with Section 703.1 of PennDOT Publication 408, Latest Edition.

E. Coarse Aggregate: Stone or gravel in accordance with Section 703.2 of PennDOT Publication 408, Latest Edition.

F. Temporary Paving: Type 2-P bituminous stockpile/cold patching material conforming to Section 484 of PennDOT Bulletin 27.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify compacted backfill is dry and ready to support paving and imposed loads.

B. Verify that gradients and elevations of the base are correct.

C. Beginning of the installation means acceptance of the substrate.

3.2 PREPARATION

A. Open bituminous paving by cutting neat straight lines. Saw cut paving approximately 6 inches beyond the line of excavation. On state and township roadways saw cut 12 inches beyond.

B. Repair all depressions, settlements, and washouts before placing paving.

C. Clean existing bituminous surface with broom before placing wearing course.

3.3 PLACING BITUMINOUS PAVEMENT

A. Before placing wearing course, a tack coat layer shall be applied.

B. Place each course to compacted thickness to match adjacent paving. Unless otherwise provided, thicknesses shall not be less than the following minimums:

Township Road Base Course — 6 inches
State Roadways - Base Course — 6 inches
Wearing Course — 1-1/2 inches

C. Place topping course with mechanical paver within twenty four (24) hours of placing and compacting the base course.

D. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas that are inaccessible to rolling.

E. Develop rolling with consecutive passes to achieve an even and smooth finish without roller marks.

F. Seal joints between new and existing paving and at curbs with hot, bituminous material of the class and type designated for the wearing course. Apply sealant evenly and extend 2 inches in both directions from joint. Where sealant must be applied adjacent to curbing, apply sealant evenly from joint at curb outward 12 inches and upward a minimum of 2 inches on the curb face. Prior to sealing, clean and remove harmful material from the area to be sealed. Control the application rate so residual asphalt completely fills surface voids and provides a watertight joint. Remove excess bituminous material. Immediately cover with a light application of dry sand. Additionally, any roadway lines (e.g. double yellow divider lines, etc.) should be painted in place at this time.

3.4 TEMPORARY PAVING

A. Install temporary pavement at a minimum thickness of 3 inches after compaction with mechanical roller, with the top surface flush with the surface of the adjacent pavement, and maintained until permanent surface restoration is made.

B. Temporary paving shall be installed at the end of each day's work. Additionally, any roadway lines (e.g. double yellow divider lines, etc.) should be painted in place at this time.

C. Temporary paving shall remain in place a minimum of 30 days unless otherwise specified by the Engineer.

D. Temporary paving will be included in the cost of roadway/highway restoration.

E. When directed by the Engineer, remove and dispose (or recycle - Contractor's option) of temporary paving. Saw cut paving 12 inches for all roadways as shown on details for installation of permanent base and wearing course of bituminous paving.

3.5 TOLERANCES

A. Flatness: Maximum variation of 1/4-inch measured with 10-foot straight edge.

3.6 PROTECTION

A. Immediately after placement, protect pavement as required by PennDOT or respective Township codes and ordinances.

END OF SECTION 02513

SECTION 02700 - COLLISION-TYPE FIRE HYDRANT

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-6 and W-7.

1.2 REQUIREMENTS

A. Hydrants shall be designed, manufactured, and tested in compliance with the latest edition of AWWA C502 standard. Mechanical bell joint shall conform to ASA Specification A21.11, and shall be furnished with all accessories to complete the lateral connection. Hydrants shall be designed to handle 150 psi working pressure and 300 psi test pressure.

1.3 SUBMITTALS

A. Submit product data and manufacturer's installation instructions in accordance with Section 01300 - Submittals.

PART 2 - PRODUCTS

2.1 HYDRANTS

A. Main Valve Closure: Shall be of the compression type, opening against the pressure and closing with the pressure. Traffic feature to be designed so that the nozzle section of the hydrant can be rotated (by degree) to full 360-degree circle during field installations if necessary.

B. Main Valve Opening: Shall not be less than 5-1/4 inch and be designed so that removal of seat, drain valve mechanism, internal rod, and all working parts can be removed through top of hydrant. These parts shall be removable without disturbing the ground line joint or the nozzle section of the hydrant. The bronze seat shall be threaded into mating threads of bronze for easy field removal.

C. Draining System of the Hydrant: Shall be bronze and activated by the main stem without use of auxiliary rod, toggles, pins, etc. There shall be multiple drain (minimum of 2) ports to the exterior of the hydrant. Drain shutoff to be by direct-compression closure.

D. Operating Nut, Main Stem, Coupling, and Main Valve Assembly: Shall be capable of withstanding input torque of 200 ft/lbs. in opening or closing directions.

E. Hydrant Bonnet Assembly: Shall be provided with a grease or oil reservoir and lubrication system that automatically circulates lubricant to all operating stem threads and bearing surfaces each time the hydrant is operated. Downward stream travel shall be limited by a travel stop located in the upper housing of the hydrant.

F. Nozzle Section of Hydrant: Shall be designed to permit field replacement of damaged threads, excavation, or disturbing the ground line joint. Bronze nozzles are to be locked into hydrant barrel with locking lugs and be sealed by heavy- duty O-Ring. Threading of nozzles and shape of operating nut to match existing hydrants in College Township (National Standard). Hydrants shall be equipped with two, 2-1/2-inch hose nozzles and one, 4-1/2-inch pumper nozzle.

G. Inlet Size and Type: Shall be 6-inch mechanical joint with mechanical joint accessories.

H. All hydrants shall open counterclockwise.

I. Standpipe Sections: Shall be connected at the ground line by a 2-part safety flange. Depth of bury shall be 4 feet-6 inches or 5 feet-0 inches.

J. Hydrant Coatings/Finishes: Together with all internal ferrous surfaces, shall be given two (2) coats of black asphaltum varnish. The exposed surfaces above grade, including nozzle caps and bonnet, shall be given two (2) coats of paint as listed below:

Bonnet, hose and pumper caps: Bright/gloss yellow with 3M reflective paint additive
Upper and lower barrel (above grade): OSHA Safety Yellow
Lower barrel (below grade): Asphaltic coating as listed above

K. Manufacturer: American Darling.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

3.2 TESTS AND INSPECTIONS

A. Pressure and leak test as directed by Engineer. Engineer will perform inspections for visual leaks prior to backfilling. In addition, Engineer may request that a leak detection device (eg. Geophones) be made available for Engineer's use in determining integrity of work in place at no additional cost to the Engineer/Authority.

B. Hydrant and connecting section of new piping shall be cleaned and swabbed out with a 50 mg/l solution of chlorine prior to installation, then flushed when directed by Engineer.

C. Locate hydrant a minimum of 18" from center line of pumper nozzle above grade to facilitate swing of hydrant cap wrenches.

D. Submit test results.

END OF SECTION 02700

SECTION 02950 - DUCTILE IRON CEMENT-LINED PIPE

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Products and materials shall meet all applicable AWWA Standards.

B. Piping shall be rated for 250 psi minimum.

C. Pipe disinfection shall be in accordance with the requirements of AWWA C651, current edition.

1.2 SUBMITTALS

A. Submit product data and manufacturer's installation instructions in accordance with Section 01300 - Submittals.

B. Submit pressure/leak test reports in accordance with this Section, certifying that the water system was successfully pressure/leak tested as defined in this Section.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Pipe: Ductile iron, cement lined, thickness class 52, asphalt seal coating on inside and outside and class designation stamped on pipe. Joints: bell and spigot (with Tyton or equal joint).

B. Pipe shall be furnished in 20-foot lengths except when smaller lengths are required for the location of valves, fittings and/or specialties.

C. Fittings: Ductile iron, cement lined, standard thickness, asphalt seal coating on inside and outside. Joints: mechanical joint type with rubber gaskets, ductile iron gland with thrust restraint wedges with twist off nuts with alloy (Corten) bolt sets.

D. Pipe Manufacturers: U.S. Pipe, Griffin, Atlantic States, Mechanical Joint Restraint Gland EBAA (Meg-a-Lug) or Ford 1400.

E. Markings: All pipe shall be stamped with the year of manufacture.

2.2 COUPLINGS

A. Couplings: Epoxy-fusion-coated steel couplings for plain end, cast or ductile iron pipe with middle ring, followers, gaskets and stainless steel bolt sets. Length: 10 inches.

1. Manufacturers: Smith Blair 411 or equal.

2.3 TRANSITION COUPLINGS

A. Cylindrical, epoxy-fusion-coated steel middle and follower rings, resilient gaskets as selected with stainless steel trackhead bolts. Length: 10 inches.

B. Manufacturers: Smith Blair 413 or equal.

2.4 POLYETHYLENE ENCASEMENT

A. Polyethylene film in tube form to be used for encasement of piping as indicated on areas. Polyethylene film shall conform to the requirements of AWWA C105.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide 6-inch pipe bedding in accordance with drawing details. Bedding shall be in accordance with Section 02224 - Trenching, Bedding, and Backfilling.

B. Verify that trench and bedding is true to line and grade and at correct elevation and location.

3.2 INSTALLATION

A. Establish elevations of buried piping to ensure not less than 4 feet of cover.

B. Separation of Water Mains, Sanitary Sewers and Storm Sewers (refer to Standard Details W-9, W-10 and W-11):

1. Parallel Installation - Whenever possible, water mains shall be laid at least 10 feet horizontally from any existing sewer or storm drain. The distance shall be measured edge to edge. In cases where a 10 foot-separation cannot be maintained, the following instructions apply:

   - The water main shall be laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer or drain.
   - The bottom of the water main shall be at least 18 inches above the top of the sewer or drain.

2. Cross Overs - Whenever water mains must cross over building drains, storm drains, or sanitary sewers, the following installation instructions shall apply:

   - A vertical separation of at least 18 inches between the bottom of the water main and the top of the sewer or drain shall be maintained.
   - The length of the water main shall be centered at the point of crossing so that the joints shall be equivalent and as far as possible from the sewer or drain.

3. Cross Unders - Whenever water mains must cross under building drains, storm drains or sanitary sewers, the following installation instructions shall apply:

   - A vertical separation of at least 18 inches between the bottom of the sewer or drain and the top of the water main shall be maintained.
   - Polyethylene encasement of the new water line shall be utilized and shall be installed per AWWA C105 method A or B.
   - Adequate structural support for the sewers or drains shall be provided to prevent excessive deflection of the joints and the settling on and breaking of the sewer or water main.
   - The length of the water main shall be centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer or drain.

4. Exceptions to Parallel Installation - If the 18-inch vertical separation condition in Item 3.02 B.1 cannot be met, the following installation instructions apply:

   - Polyethylene encasement of the new water main shall be utilized and shall be installed per AWWA C105 Method A or B.

5. Exceptions to Cross Overs and Cross Unders - If any conditions in Item 3.02 B.2 or 3 cannot be met, the following installation instructions shall apply:

   - Concrete encasement of the sewer or drain shall be provided if approved in writing by the Engineer. If the concrete encasement method is utilized, the concrete shall extend 3 feet in each direction from the crossing. The 3 feet is to be measured as a perpendicular distance from the sewer or drain. Concrete requirements are same as specified in Section 02994 - Thrust Blocks.

6. Where the installation instructions of Items 3.02 B, 1, 2, 3, 4, or 5 cannot be met, contact the Engineer for direction.

C. Separation of water mains in respect to gas, electric and telephone lines.

The following separations are recommendations; however, the final decision will be as directed by the appropriate utility company.

1. Parallel Installation - whenever possible, water mains shall be laid at least 3-feet horizontally from any existing gas, electric or telephone line. The distance shall be measured edge to edge.

2. Cross Unders - whenever possible, water mains shall be laid at least 18 inches vertically from any existing gas, electric or telephone line. The distance shall be measured edge to edge.

3. Cross Overs - not recommended; contact utilities for approval.

D. Store gaskets at temperature above 40 degrees F. Clean and dry bell joint and gasket before gasket insertion. Ensure that gasket is evenly seated.

E. Clean plain end of pipe and lubricate gasket before joining sections. Align sections and insert pipe until it makes contact with the bottom of the bell, or to point indicated on pipe as directed by pipe manufacturer's instructions.

F. Use a timber header between pipe and backhoe when pushing pipe sections together with a backhoe.

G. File or grind the outside edge of field cut piping to remove sharp edges which could damage a gasket.

H. Do not exceed 3-degree deflection of pipe at joints.

I. Provide thrust blocking at locations indicated on details.

J. Clean dirt and debris from each section of pipe and fitting immediately after installation.

K. Protect pipe and fitting coatings from damage. Repair any damage to coatings in accordance with manufacturer's recommendations.

L. Securely block each pipe opening at the end of each workday with watertight bulkheads to prevent entrance of mud, water and/or dirt.

3.3 CONNECTION TO EXISTING MAINS

A. The Contractor shall determine what type of fittings or joints are required for connection to existing mains.

B. Provide transition couplings when connecting to existing piping where the outside diameter varies from the new pipe to the existing pipe.

C. Determine the exact location on existing piping for point of new to existing interconnections.

D. Review proposed fittings and exact locations of connections to existing mains with Engineer prior to starting work on connections.

E. Notify the Authority before permanently connecting new to existing water main at each point.

3.4 TESTING

A. Pressure test after the line has been laid and partially backfilled between joints. Should the Contractor elect to backfill the entire trench, or any portion thereof, prior to testing, the Contractor shall locate and repair any leaks which occur during the test.

B. Pressure and leak test at fifty percent (50%) above normal working pressure at the highest point along the test section as determined by the Engineer in the presence of the Engineer or Authority's representative and in accordance with the local plumbing code. In no case shall the test pressure be less then 150 psi. Test pressure shall not vary by more than 5 psi for the duration of the test.

C. Contractor shall provide apparatus necessary for testing. Apply pressure with a pump connected to the main. Measure make-up water with a meter.

D. Inspect fittings, joints and valves during testing. Any defective components shall be removed and replaced by the Contractor.

E. Before applying the specified pressure test, all air shall be expelled from the pipe.

F. While the test pressure is being maintained, all exposed pipes, fittings, valves and joints shall be inspected for leaks. The test pressure shall be maintained for a period of not less than two (2) hours if joints are exposed and four (4) hours when joints are covered or less if deemed appropriate by the Engineer.

G. The allowable leakage in gallons per hour per 1,000 feet of pipeline, shall be as noted in the following table:

	Nominal Pipe Diameter (Inches)					
Average Testing Pressure	**4**	**6**	**8**	**10**	**12**	**16**
150	0.37	0.55	0.74	0.92	1.10	1.47
175	0.40	0.59	0.80	0.99	1.19	1.59
200	0.43	0.64	0.85	1.06	1.28	1.70
225	0.45	0.68	0.90	1.13	1.35	1.80

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

H. Tests shall be repeated until results are in conformance with specified requirements.

I. Submit test reports.

3.5 DISINFECTION OF POTABLE WATER MAINS

A. Place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-foot intervals. The quantity of granules shall be as shown in the table below.

WARNING: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

Pipe Diameter (Inches)	**Calcium Hypochlorite Granules (Ounces)**
4	0.5
6	1.0
8	2.0
12	4.0
16 and larger	8.0

B. Place 5g calcium hypochlorite tablets in each section of pipe and also place one such tablet in each hydrant, hydrant branch, and other appurtenance. The number of 5g tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. The table below shows the number of tablets required for commonly used sizes of pipe.

Number of 5g Calcium Hypochlorite Tablets Required for Dose of 25 mg/L*.

	Length of Pipe Section				
Pipe Diameter Inches	**13 feet or less**	**18 feet**	**20 feet**	**30 feet**	**40 feet**
	Number of 5g Calcium Hypochlorite Tables				
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13
***Based on 3.25g available chlorine per tablet; any portion of tablet rounded to next higher number.**					

The tablets shall be attached by a food-grade adhesive. Examples of food-grade adhesives are Permatex Form-A-Gasket No. 2 and Permatex Clear RTV Silicone Adhesive Sealant, which are manufactured by Loctite Corporation, Kansas City, KS 66115. These products have both been approved by USDA for uses that may contact edible products. Neither product has been approved in accordance with NSF Standard 61. Other company products, such as Permatex Form-A-Gasket No. 1, have not received FDA approval.

There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

C. When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 degrees F (5 degrees C), the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service.

D. Water for filling the mains shall be furnished by the Authority.

E. After the applicable retention period, the Authority will obtain a chlorine sample to ensure a 25 mg/l dose was established. After results are obtained, proven acceptable, flush chlorinated water from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system or 2 ppm. Authority's personnel shall determine chlorine concentration.

F. The environment to which the chlorinated water is to be discharged shall be inspected. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied at Contractors expense to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.

G. Authority personnel will take one sample at the end of the line and every 1000 feet of water main 24 hours after flushing. Samples shall be tested for bacteriological quality and shall show the absence of coliform organisms before the main is placed in service.

H. If the initial disinfection fails to produce satisfactory bacteriological samples, the main must be reflushed and resampled. If check samples show the presence of coliform organisms and the new main shall be re-chlorinated until satisfactory results are obtained.

I. All samples shall be taken and tested by Authority personnel. Coordinate this activity with them. Costs for sampling and testing shall be borne by the Contractor.

END OF SECTION 02950

SECTION 02954 - SERVICE LATERAL PIPING

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-6 and W-9.

1.2 REQUIREMENTS

A. Products, valves and materials shall meet all applicable AWWA and ASTM Standards.

B. Piping shall be rated for 250 psi minimum and valves shall be rated for 175 psi minimum with no leakage.

1.3 SUBMITTALS

A. Submit product data and manufacturers installation instructions in accordance with Section 01300 - Submittals.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Copper pipe, Type K soft temper annealed with brass fittings.

2.2 FLANGES, UNIONS, AND COUPLINGS

A. Bronze unions with compression or flare joints.

2.3 CORPORATION STOPS

A. Copper Services 2 Inches and Under: Brass body, flare or compression connections, 175 psi rating with quarter bend coupling, for copper tubing connection.

B. Manufacturer: Mueller H-15035.

2.4 CURB STOPS

A. Curb Stops 2 Inches and Under: Ground key type with brass body, with key operator, flare-type or compression connections and 175 psi rating.

B. Manufacturer: Mueller H-15000 or H-15008.

2.5 SERVICE COUPLINGS

A. Service Couplings 2 Inches and Under: Brass union coupling with flare or compression ends for connection of new service to old copper tubing.

B. Manufacturer: Mueller.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Establish elevations of buried piping to ensure not less than 4 feet of cover.

B. Install specialties in accordance with manufacturer's recommendations.

C. Curb stops shall be located a minimum of 1 feet-0 inches behind the curb or the proposed curb line. Do not locate curb stops in a swale.

D. Install corporation stops with two layers of 3-Mil TFE tape or pipe dope to male threads.

E. Provide unions downstream of valves and at equipment or apparatus connections.

F. Provide non-conducting dielectric unions whenever jointing dissimilar metals.

3.2 TESTING

A. A visual test will be performed once service lateral is installed.

B. Defective components shall be removed and replaced by the Contractor. Repeat test until results are in conformance with specified requirements.

3.3 FLUSHING

A. Flush water through each service lateral after the main is disinfected and flushed.

END OF SECTION 02954

SECTION 02966 - VALVE BOXES

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-3 - W-8, and W-13.

1.2 SUBMITTALS

A. Submit product data and manufacturers installation instructions in accordance with Section 01300 - Submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type 1: Roadway Style: 5-1/4" inside diameter, cast iron, asphaltic coated 3-piece adjustable valve box, round head with the word **"WATER"** printed on top.

1. Manufacturers: Bingham & Taylor, Mueller or Tyler.

B. Type 2: Curb Stop Box: 1" inside diameter upper section, asphaltic coated 2-piece cast iron with operating rod and lid with brass head plug.

1. Manufacturer: Ford Model EA2-40-40-24R or Mueller.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Type 1 valve boxes at every distribution valve, blow-off valve, and hydrant isolation valve.

B. Provide valve box length as required to accommodate valve depth.

C. Provide Type 2 valve boxes with extended rods for curb stops.

D. Support valve boxes in accordance with details.

E. Valve boxes shall be flush with the finish grade.

F. Locate curb stop valve box in concrete sidewalk. If area does not specify for the installation of sidewalk, provide 4" thick concrete pad a minimum of 12" square as noted on the standard details.

END OF SECTION 02966

SECTION 02968 - WATER DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-3, W-4 and W-13.

1.2 REQUIREMENTS

A. Valves shall meet all applicable AWWA Standards.

B. Shall be rated for 200 psi minimum with no leakage.

C. Valves shall be line size in accordance with the diameters shown on the drawings.

D. Valves shall open by turning counter clockwise.

1.3 SUBMITTALS

A. Submit product Data and Shop Drawings in accordance with Section 01300- Submittals.

PART 2 - PRODUCTS

2.1 RESILIENT SEAT GATE VALVES

A. Resilient Seat Gate Valves 12 Inches and Under for Buried Service Installation: Resilient wedge, iron body, bronze trim, resilient seat for zero leakage, mechanical joint ends, non-rising stem, O-Ring packing, 2-inch operating nut, epoxy coating inside and outside applied before valve assembly.

B. Manufacturer: Mueller A-2360 or US Metroseal.

2.2 BUTTERFLY VALVES

A. Butterfly Valves 14 Inches and Over: ASTM A 126 Class B cast iron body; with mechanical joint or flanged connections as noted on the drawings. Interior of valves shall be coated with epoxy suitable for potable water. Exterior of valve and actuator shall be coated with asphalt varnish.

B. Valve disc shall be ductile iron with Buna N resilient seat located in body or on valve disc. Field replaceable seats for 30-inch and larger valves per AWWA C504. Epoxied in seats for 30-inch and larger valves are not acceptable. The mating seat shall be ASTM A-304 stainless steel.

C. Valve shaft shall be 304-type stainless steel with self-lubricating, corrosion-resistant sleeve.

D. Traveling nut manual actuator with 2-inch operating nut for buried service rated for 300 ft. lbs. of input torque.

E. Basis of Design: American Darling or Mueller.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves in accordance with manufacturer's recommendations.

B. Install each distribution valve vertically with valve support and valve box in accordance with drawing details and Section 02966 - Valve Boxes.

C. Clean dirt and debris from each valve immediately after installation.

D. Protect valve coatings from damage. Repair any damage to coatings in accordance with manufacturer's recommendations.

END OF SECTION 02968

DOCUMENT 02970 - TAPPING SLEEVE AND GATE VALVE

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Detail W-13.

1.2 REQUIREMENTS

A. Valves shall meet AWWA C500 and C509 Standards.

B. Shall be rated for 200 psi minimum with no leakage.

C. Valves shall be line size in accordance with the diameters shown on the drawings.

D. Valves shall open by turning counter clockwise.

1.3 SUBMITTALS

A. Submit Product Data and Shop Drawings in accordance with Section 01300 - Submittals.

PART 2 - PRODUCTS

2.1 RESILIENT SEAT GATE VALVES

A. Buried Service Installation 12 Inches and Under: Resilient wedge disc iron body, bronze trim, resilient seat for zero leakage, flanged end, mechanical joint end for tapping sleeve installation, non-rising stem, 0-Ring packing, 2-inch operating nut, epoxy or bituminous coating inside and outside applied before valve assembly.

B. Manufacturer: Mueller H-615 and T-2360 or US T-9.

2.2 MJ-TYPE TAPPING SLEEVE

A. Ductile iron mechanical joint tapping sleeve for installation on cast and ductile iron pipe; duck-tipped end gaskets; asphaltic coated; 200 psi working pressure with flanged outlet.

B. Manufacturer: Mueller H-615 and T-2360 or US T-9.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install tapping valves and sleeves in accordance with manufacturer's recommendations.

B. Install each distribution valve vertically with valve support, concrete/concrete block base, and valve box in accordance with drawing details and Section 02966 - Valve Boxes.

C. Clean dirt and debris from each valve immediately after installation.

D. Protect valve coatings from damage. Repair any damage to coatings in accordance with manufacturer's recommendations.

E. Excavation at tapping sleeve location shall be increased to accommodate tapping machine operation.

END OF SECTION 02970

SECTION 02994 - THRUST BLOCKS

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Details W-14 and W-15.

1.2 REQUIREMENTS

A. Install concrete thrust blocks at each elbow, tee, and capped or valved end fittings located in the horizontal plane. Mechanical joint restraint must be utilized in the vertical planes.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement to be ANSI/ASTM C150, Type III, High, Early Strength Portland.

B. Aggregates to be normal weight ANSI/ASTI C33.

C. Water to be clean and not detrimental to concrete.

D. Air-entraining admixture to be ANSI/ASTM C260.

2.2 CONCRETE MIX

A. Mix concrete in accordance with ANSI/ASTM C94.

B. Concrete to have a 3000 psi, 7-day compressive strength.

2.3 REINFORCING STEEL

A. Reinforcing bars to be ANSI/ASTM A615, Grade 60 deformed.

B. Steel wire to be ANSI/ASTM A82, plain, cold-drawn steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work, and that excavations, dimensions and elevations are as indicated on drawings.

3.2 INSTALLATION

A. Place, support and secure reinforcement against displacement.

B. Concrete shall be poured against undisturbed earth or rock.

END OF SECTION 02994

SECTION 02996 - THRUST CLAMPS

PART 1 - GENERAL

1.1 REFERENCES

A. Refer to Standard Detail W-12.

PART 2 - PRODUCTS

2.1 DUCTILE IRON LUG ATTACHMENT

A. Cast ductile iron for placement between mechanical joint.

B. Attachment shall be capable of serving 4-inch up to 16-inch pipe.

C. Manufacturer: Duc-lug #S-14.

2.2 UNDERGROUND FRICTION PIPE CLAMP

A. 2-inch wide x 1/2-inch-thick flat bar stock single bolts, underground friction clamp with asphalt coating.

B. 2- to 5-inch-wide x 1/2- to 3/4-inch-thick flat bar double bolts and washers, underground friction clamp with asphalt coating.

C. Manufacturer: Astral Corp #380 and #385.

2.3 THREADED RODS/ANCHOR EYE BOLTS

A. Threaded rods and anchor eye bolts shall be 3/4-inch diameter and will have continuous threads.

B. Manufacturer: Astral-Corten.

2.4 MECHANICAL JOINT RESTRAINT

A. Ductile iron mechanical joint retainer glands and flange adaptors with thrust restraint wedges, twist off nuts, gaskets and galvanized (Corten bolts).

B. Manufacturer: EBAA (Meg-a-Lug) or Ford 1400.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide thrust clamps with lugs and rods at each elbow located in the vertical plane.

B. Locate lug attachment with mechanical joint bolt thru lug between bell flange and gland.

C. Provide thrust clamps with rods for anchoring fire hydrant in addition to installing concrete thrust block.

D. Locate friction clamp behind bell of pipe.

E. Provide single bolted clamp with anchor eye bolts when clamping distance is 12 inches or less.

F. Provide double bolted clamp, continuous threaded rod with nuts and washers when distance is greater than 12 inches up to 10 feet.

G. Provide pipe cap or plug at main dead end or future connection with rods and clamp locating clamp behind bell of pipe.

H. Provide rods, lugs, clamps, gripper type glands or "Meg-a-Lug" flanges to anchor existing and/or new valve and fittings to prevent valve/fitting separation.

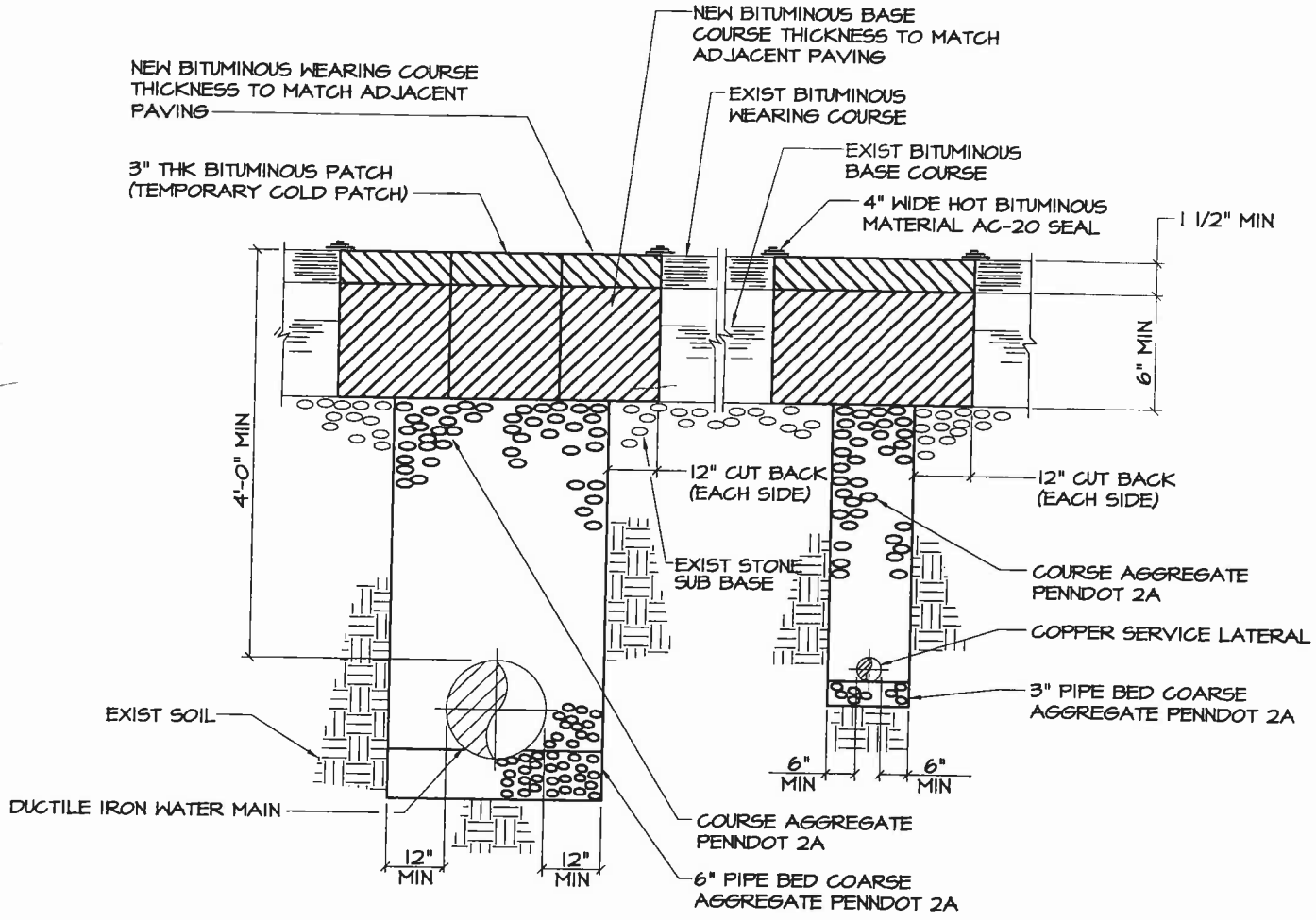
I. When utilizing mechanical restraint systems in lieu of concrete thrust blocks, the minimum mechanically-restrained, combined length of pipe (LF) required to secure an elbow, cap, or valved end fitting shall be determined by the following table. Locate friction clamp behind bell of pipe such that the restrained length is greater than equal to the length of pipe requirements shown below.

Compliance with the following table is mandatory.

LENGTH OF PIPE REQUIRED (LF)						
	Type of Fitting					
PIPE SIZE	**11-1/4E**	**22-1/2E**	**45E**	**90E**	**TEE**	**CAP/ VALVE**
6-Inch	1	2	7	24	24	24
8-Inch	1	4	13	42	42	42
10-Inch	2	5	19	62	62	62
12 Inch	2	7	26	87	87	87

END OF SECTION 02996

ATTACHMENTS



TYPICAL EXCAVATION, BACKFILL & SURFACE RESTORATION DETAIL FOR STATE ROADS AND TOWNSHIP ROADS

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.

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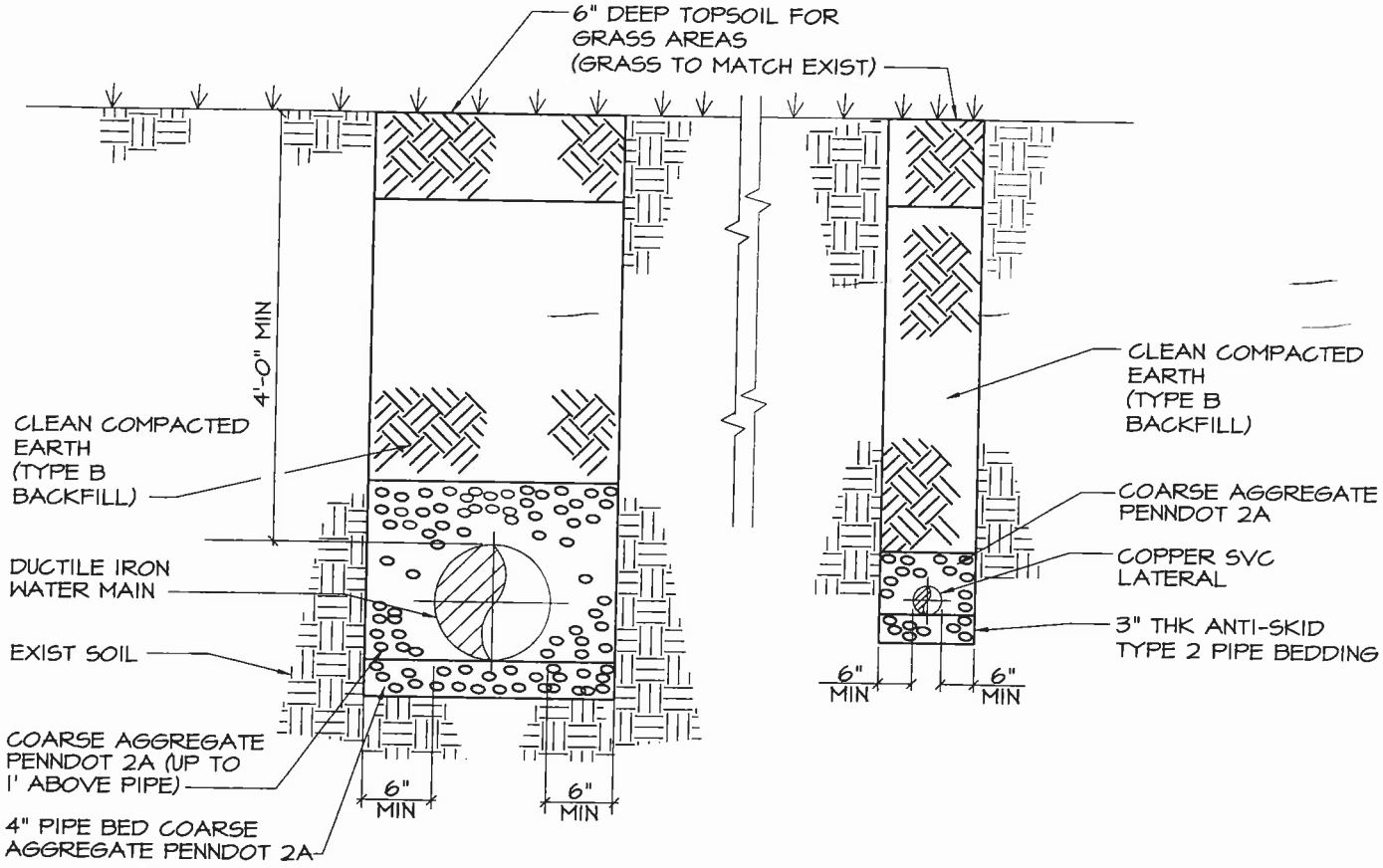
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE TRENCH RESTORTION – STATE ROAD				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-1
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



TYPICAL EXCAVATION, BACKFILL & SURFACE RESTORATION DETAIL FOR GRASS AREAS

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.

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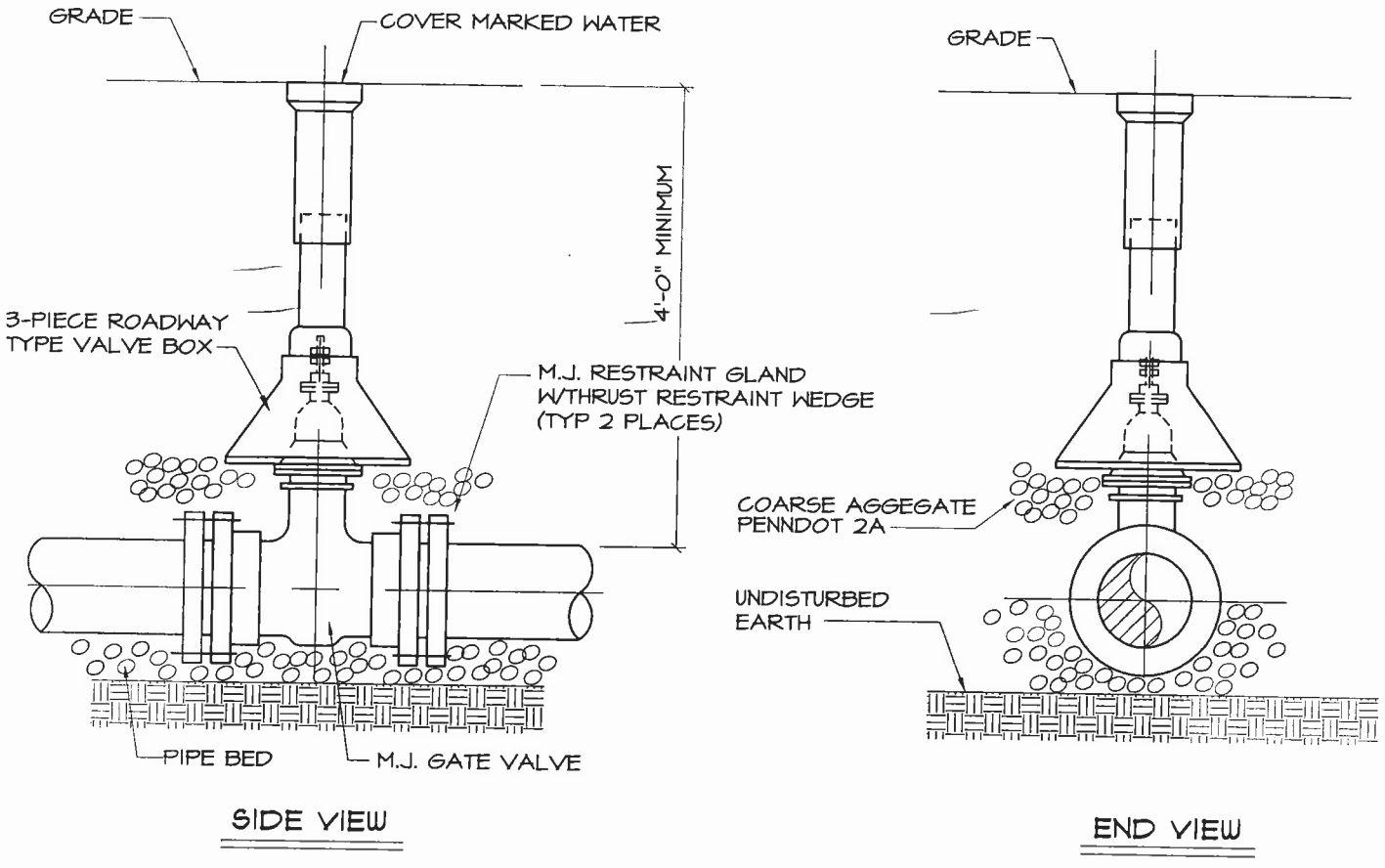
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE TYPICAL RESTORATION DETAIL FOR GRASS AREAS				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. **W-2**
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



VALVE & VALVE BOX INSTALLATION

SCALE: NONE

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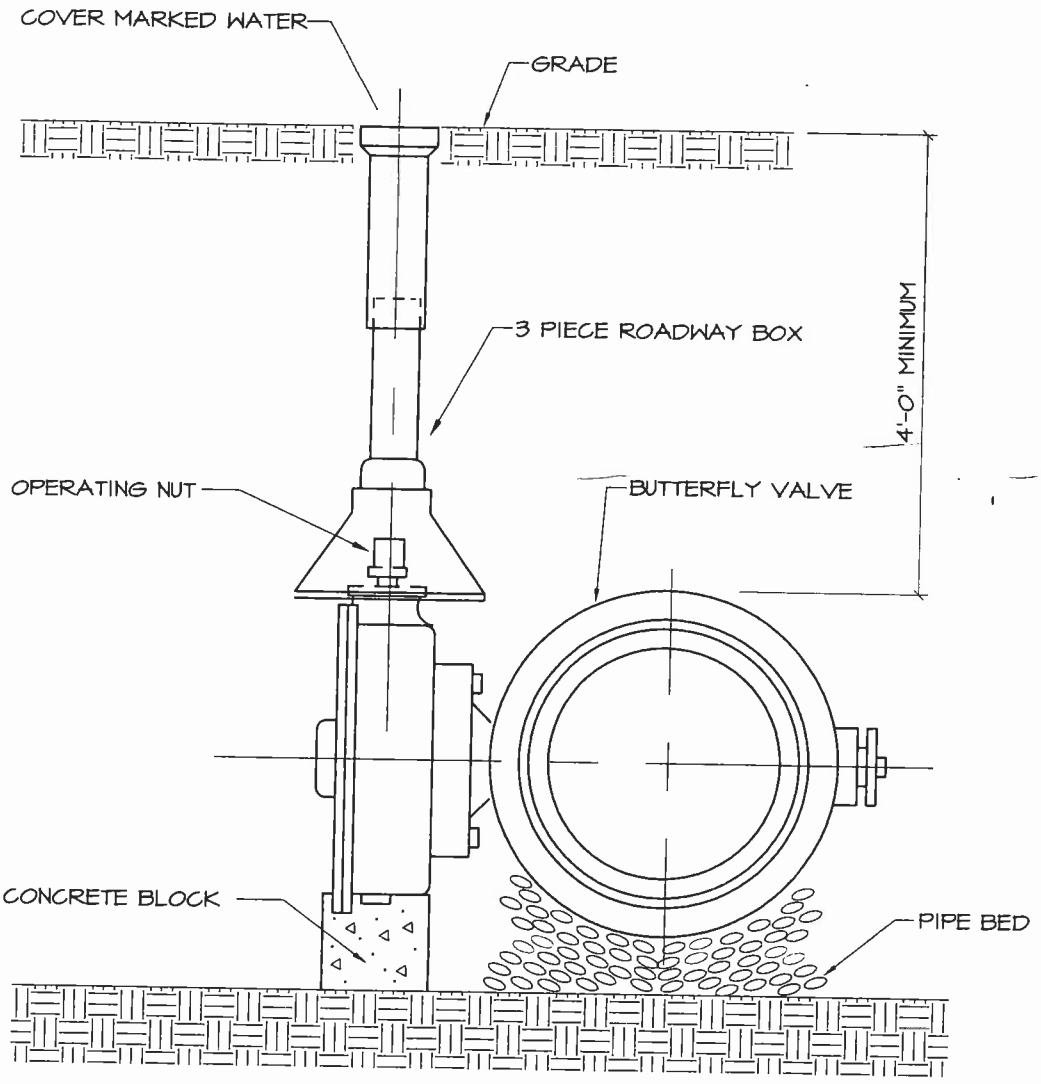
WATER AUTHORITY

INFRASTRUCTURE VALVE AND VALVE BOX INSTALLATION				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-3
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



BUTTERFLY VALVE & VALVE BOX INSTALLATION

SCALE: NONE

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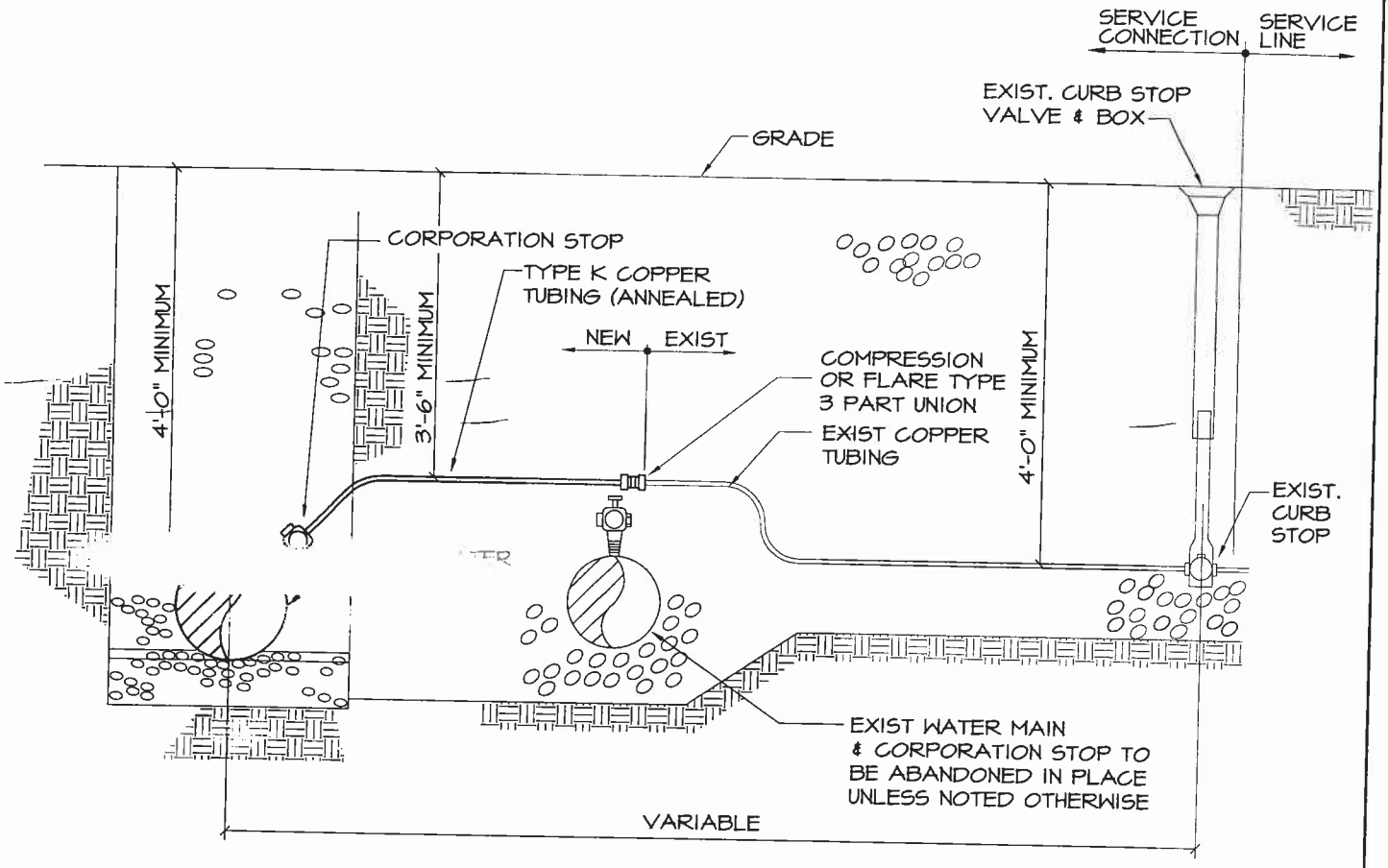
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE BUTTERFLY VALVE AND VALVE BOX INSTALLATION				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-4
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



CONNECTION FROM NEW MAIN TO EXIST SERVICE

SCALE: NONE

ENTECH Engineering Inc.
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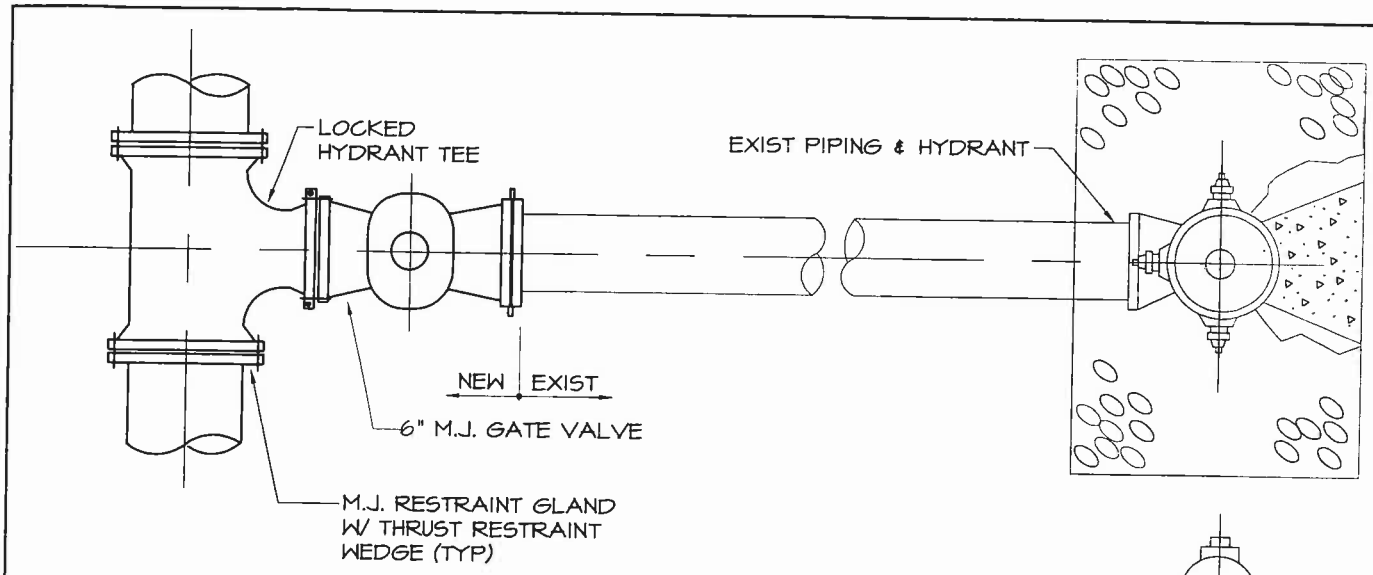
COLLEGE TOWNSHIP WATER AUTHORITY

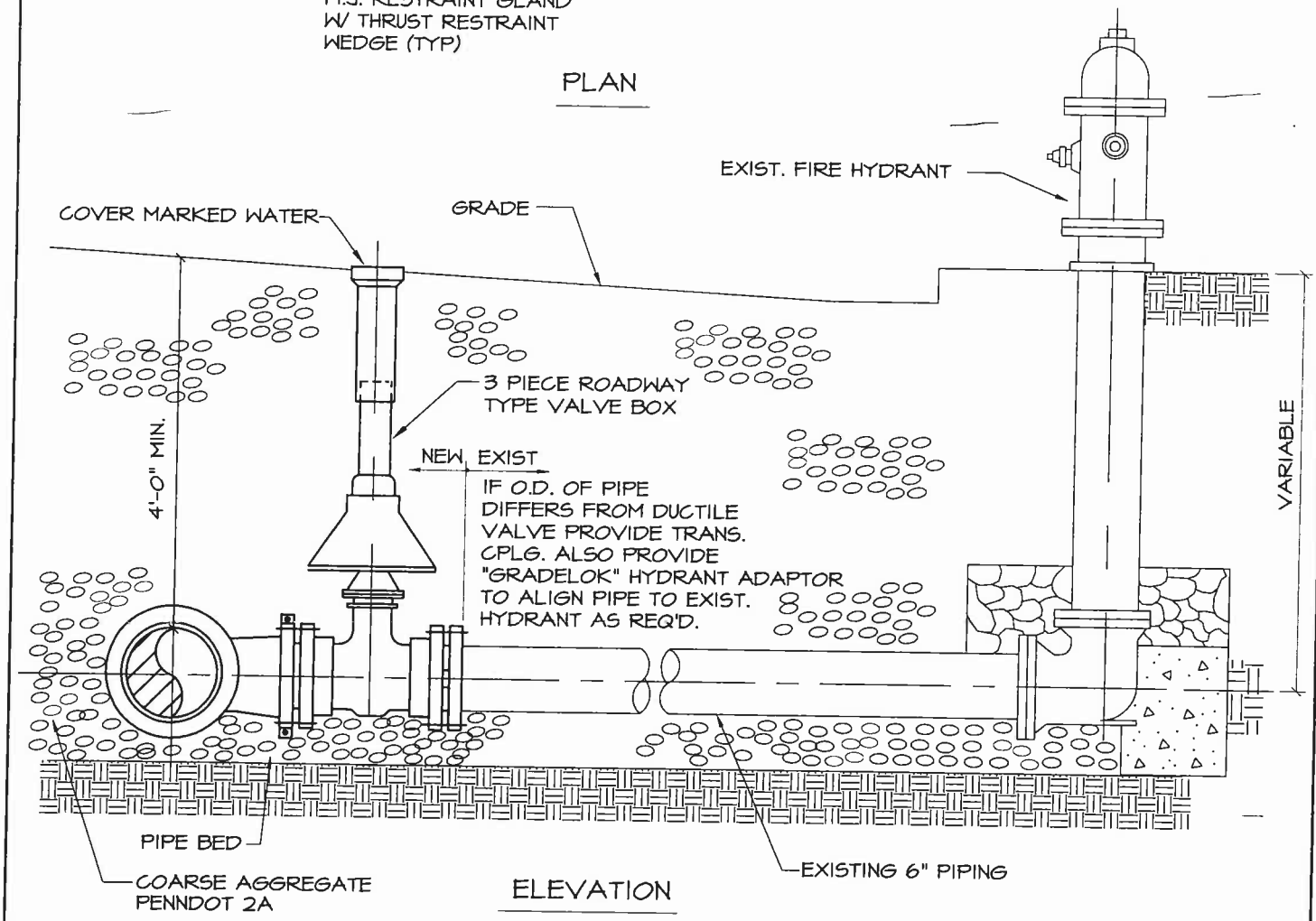
INFRASTRUCTURE
CONNECTION OF EXISTING SERVICE LATERAL

ISSUE DATE:	REV.	DRAWING NO.
1/23/98	0	W-5

DRAWN BY	CHECKED	APPROVED	PROJ. MGR.	SCALE:
BAE	SMITH	MJD	RSM	NONE



PLAN



ELEVATION

EXIST HYDRANT CONNECTION DETAIL

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.
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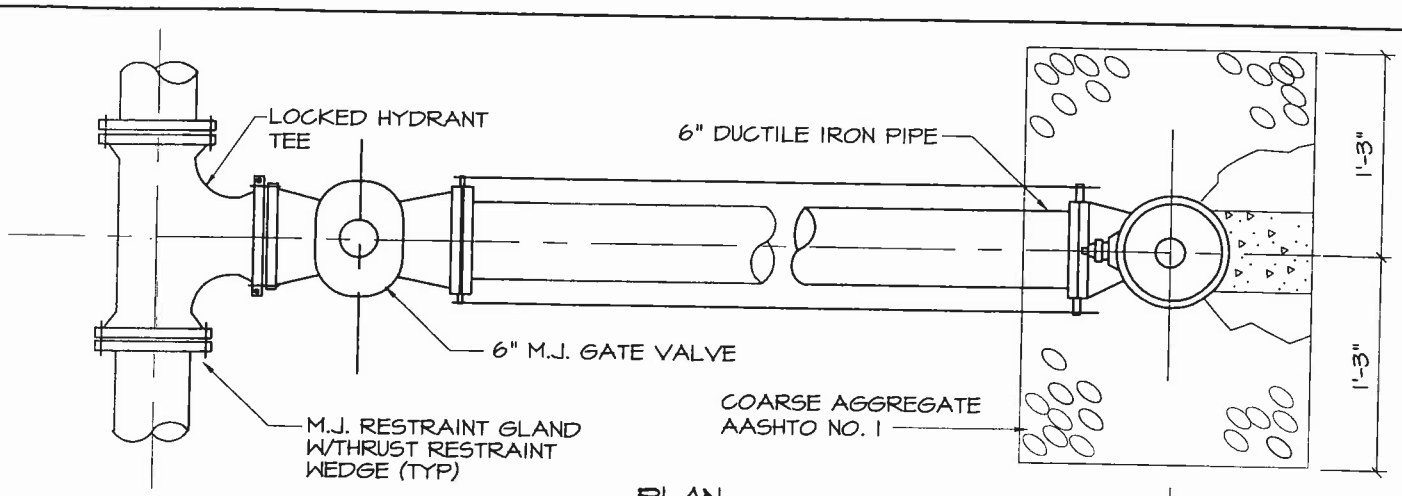
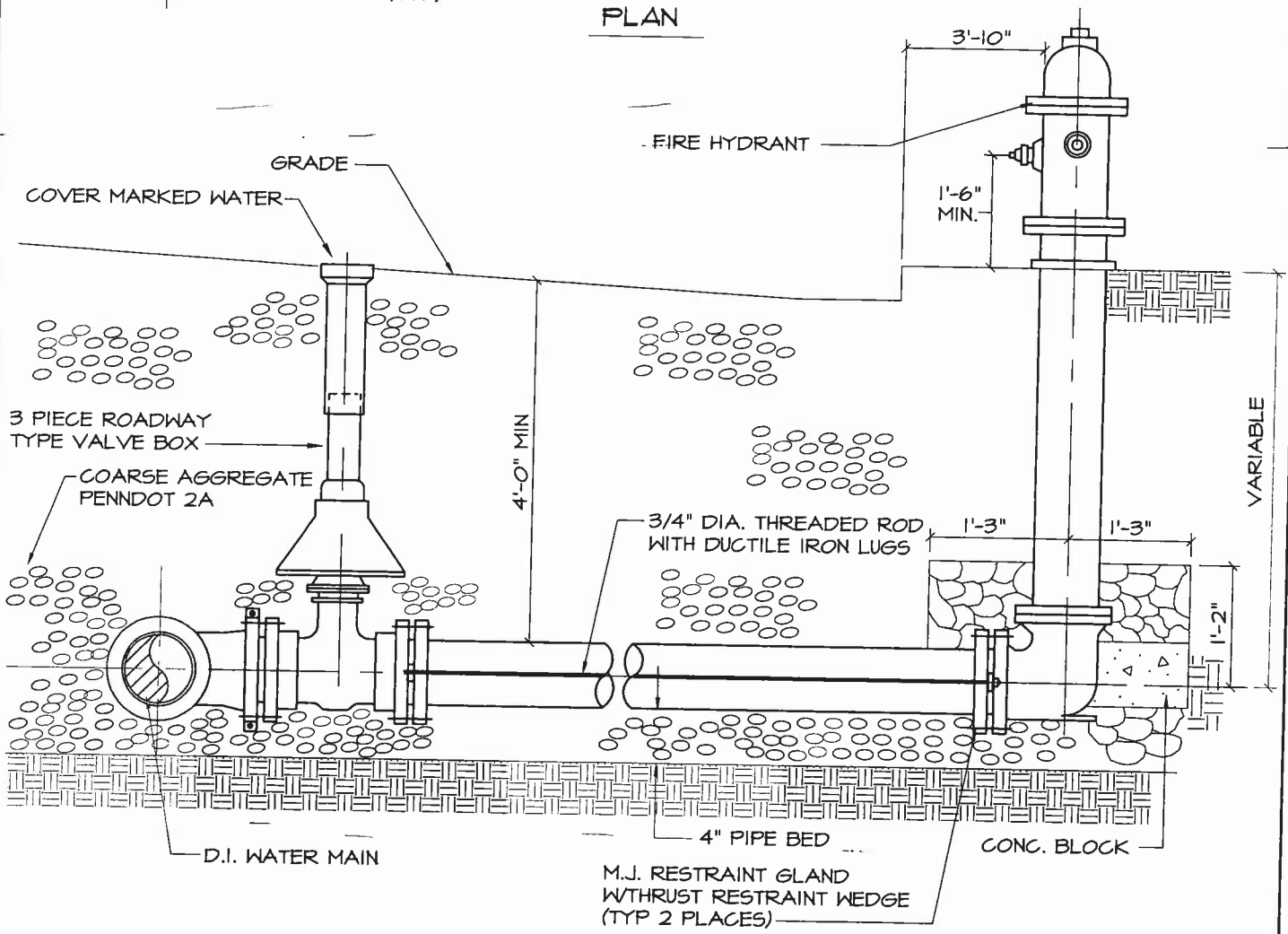
COLLEGE TOWNSHIP
WATER AUTHORITY

INFRASTRUCTURE CONNECT EXIST. HYDRANT TO NEW MAIN				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-6
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



PLAN



ELEVATION

NEW HYDRANT INSTALLATION DETAIL

SCALE: NONE

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ENTECH Architectural Services Inc.
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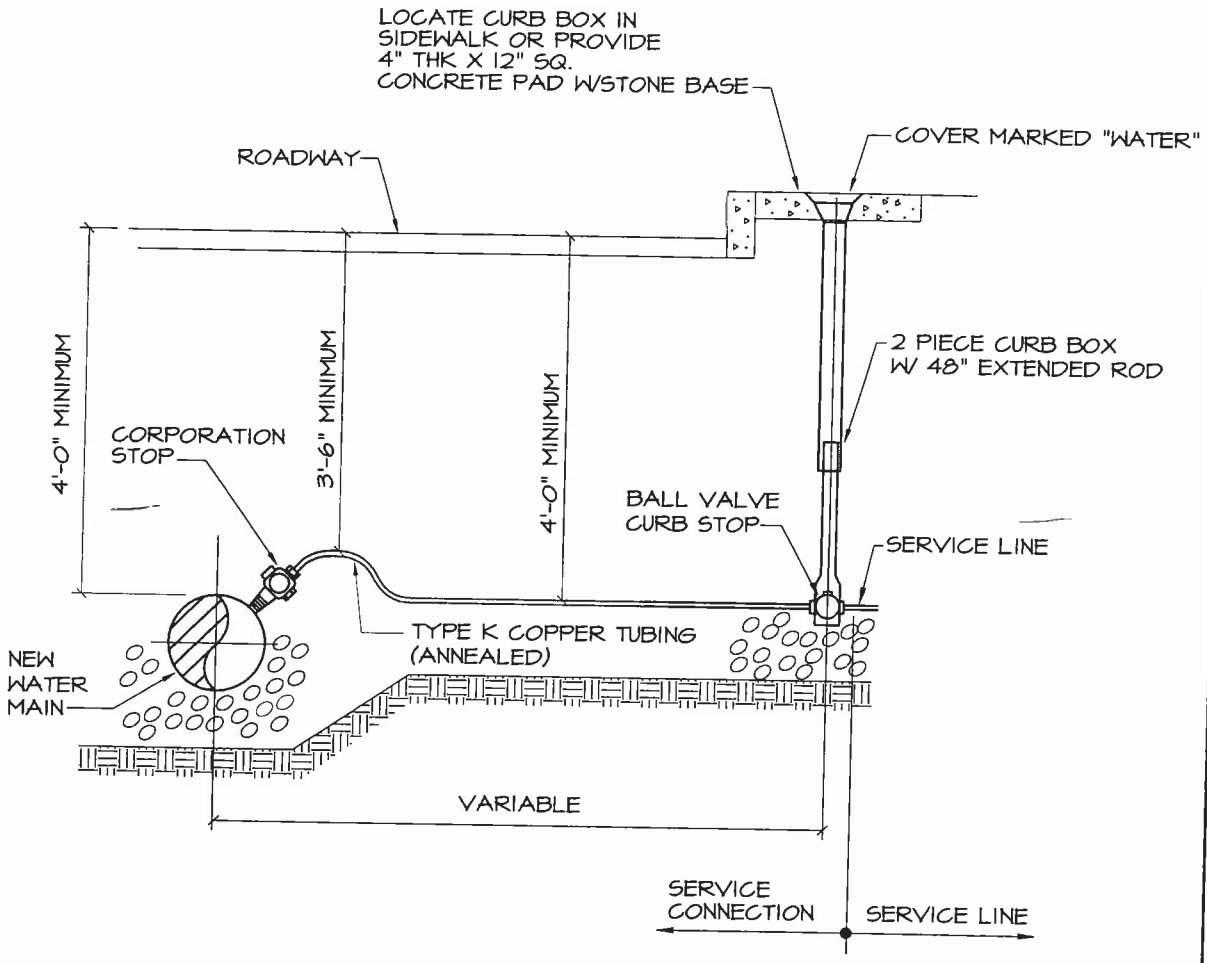
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE
NEW HYDRANT INSTALLATION

ISSUE DATE:	REV.	DRAWING NO.
1/23/98	0	W-7

DRAWN BY	CHECKED	APPROVED	PROJ. MGR.	SCALE:
BAE	SMITH	MJD	RSM	NONE



TYP. 3/4" TO 1 1/2" SERVICE CONNECTION

SCALE: NONE

OR

REPLACEMENT OF EXISTING LATERAL TO COPPER

SCALE: NONE

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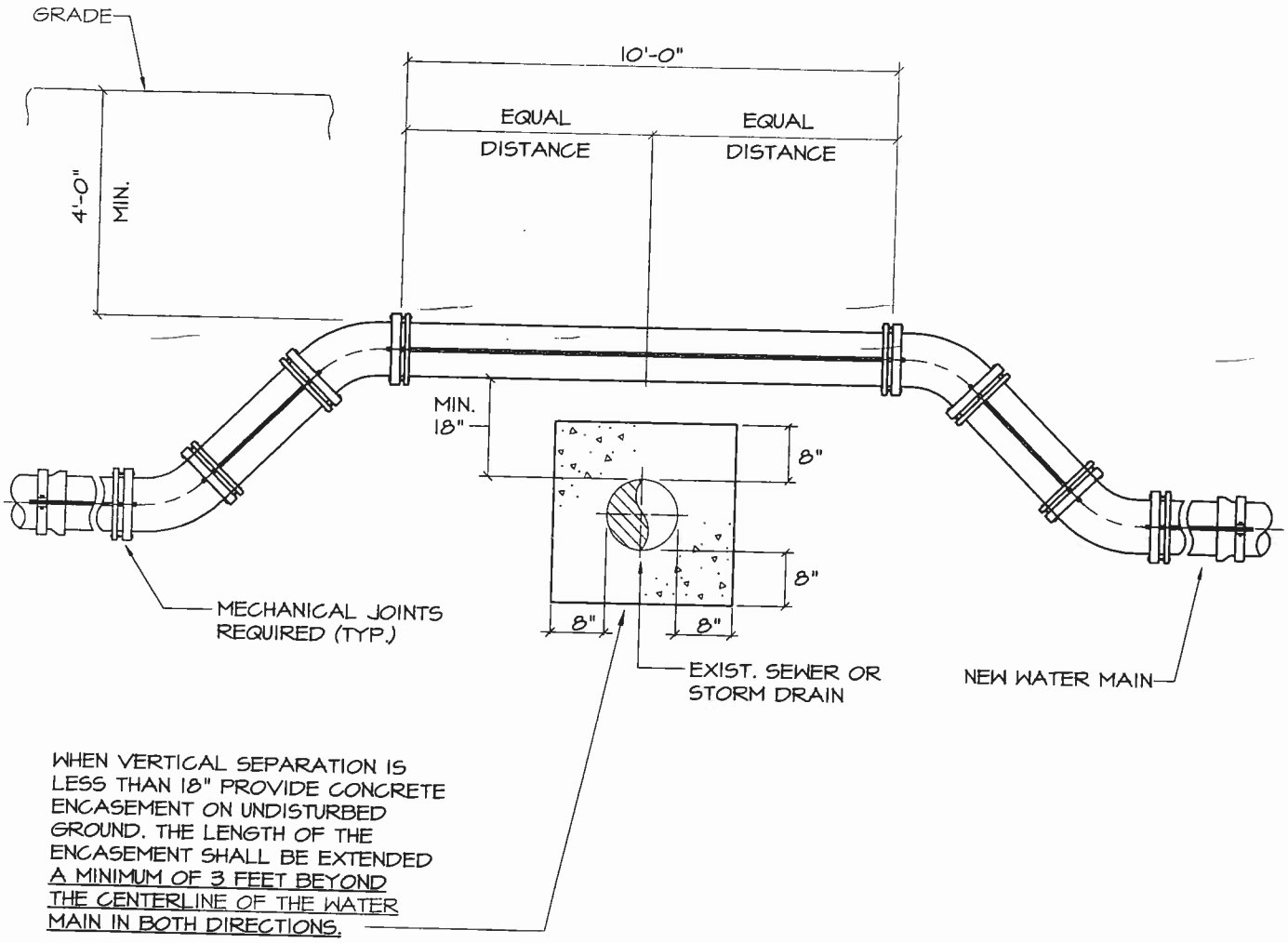
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE
NEW SERVICE LATERAL INSTALLATION

ISSUE DATE:	REV.	DRAWING NO.
1/23/98	0	W-8

DRAWN BY	CHECKED	APPROVED	PROJ. MGR.	SCALE:
BAE	SMITH	MJD	RSM	NONE



WATER MAIN - EXIST. SEWER CROSS OVER DETAIL

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.
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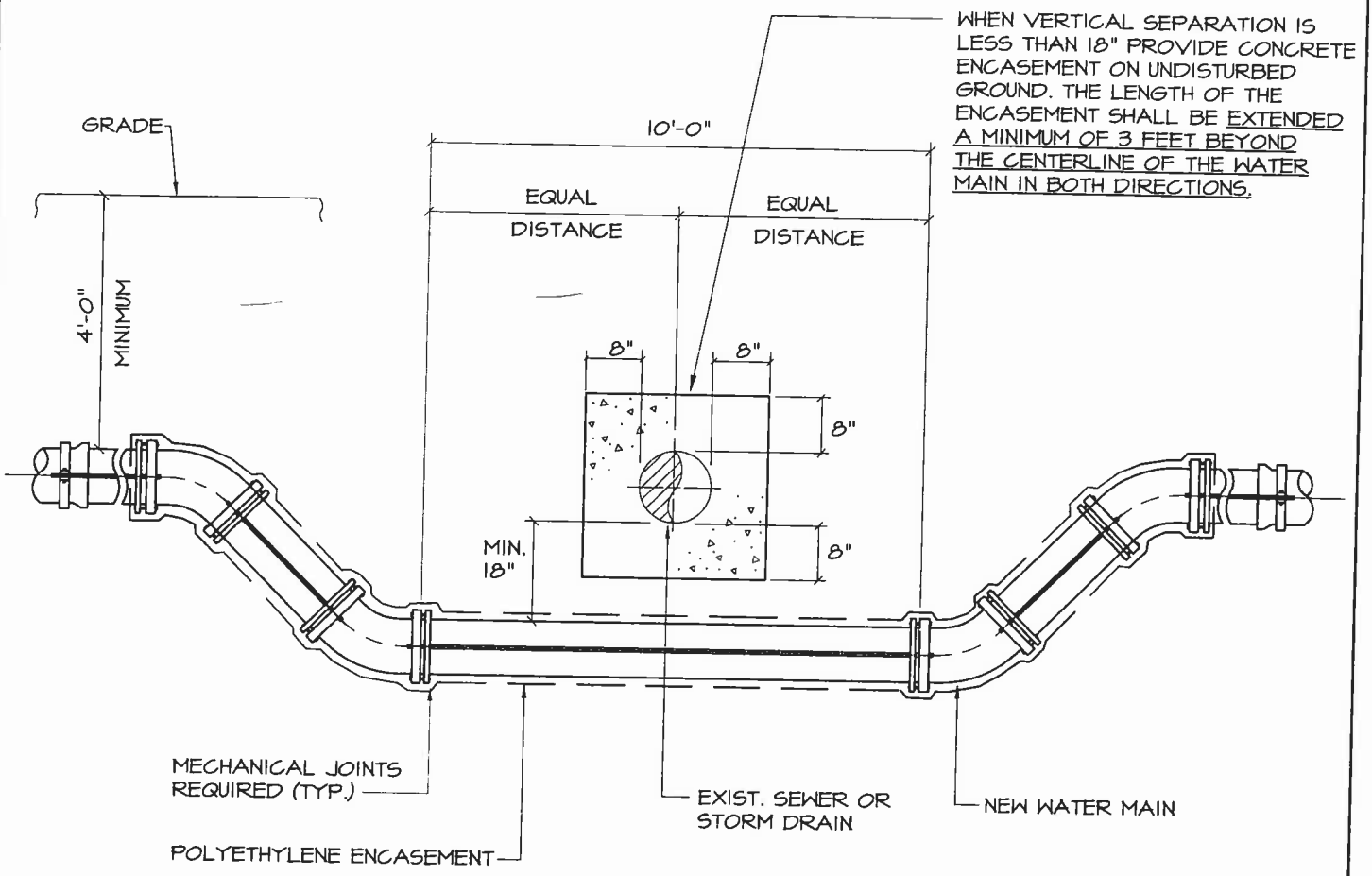
△ 1851 WEST END AVE P.O. BOX 389 POTTSVILLE, PA (717) 628-5655

COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE SEWER CROSSOVER DETAIL				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-9
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



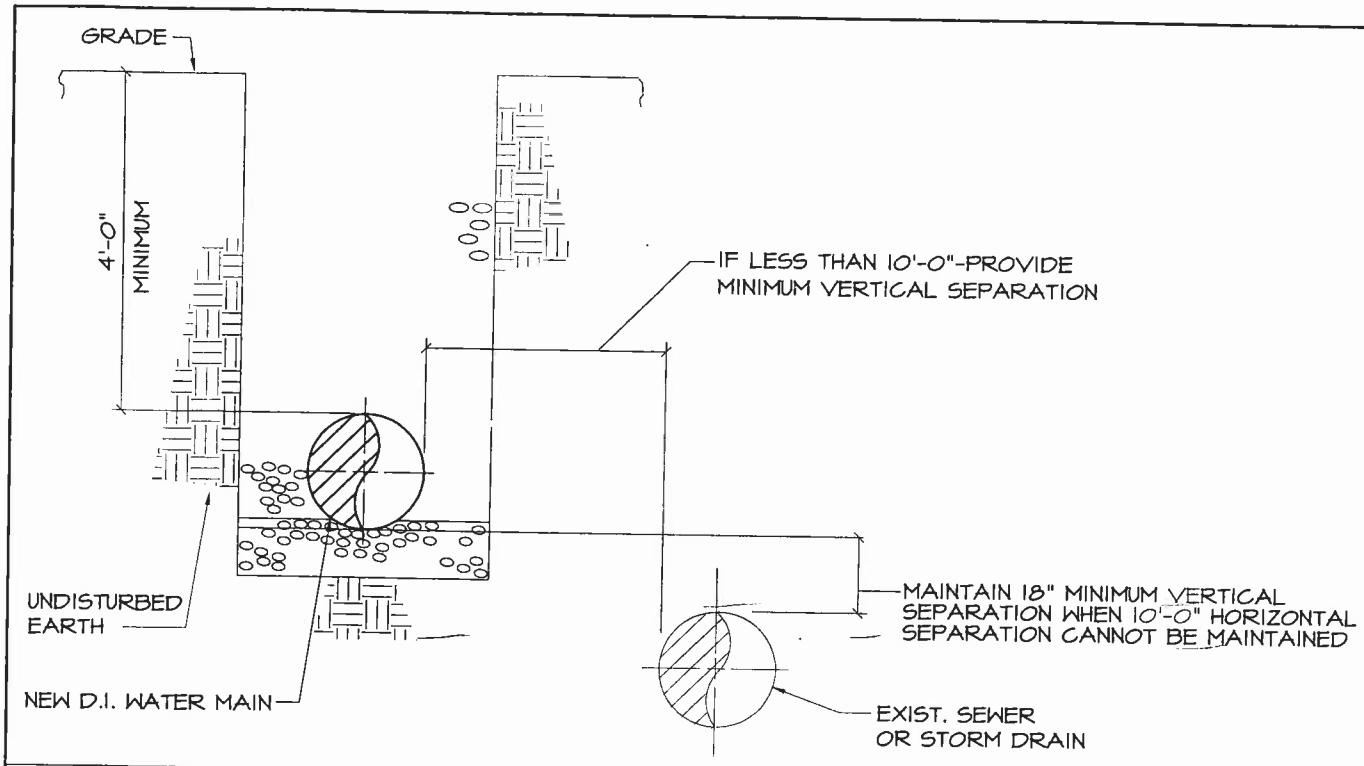
WATER MAIN - EXIST. SEWER CROSS UNDER DETAIL

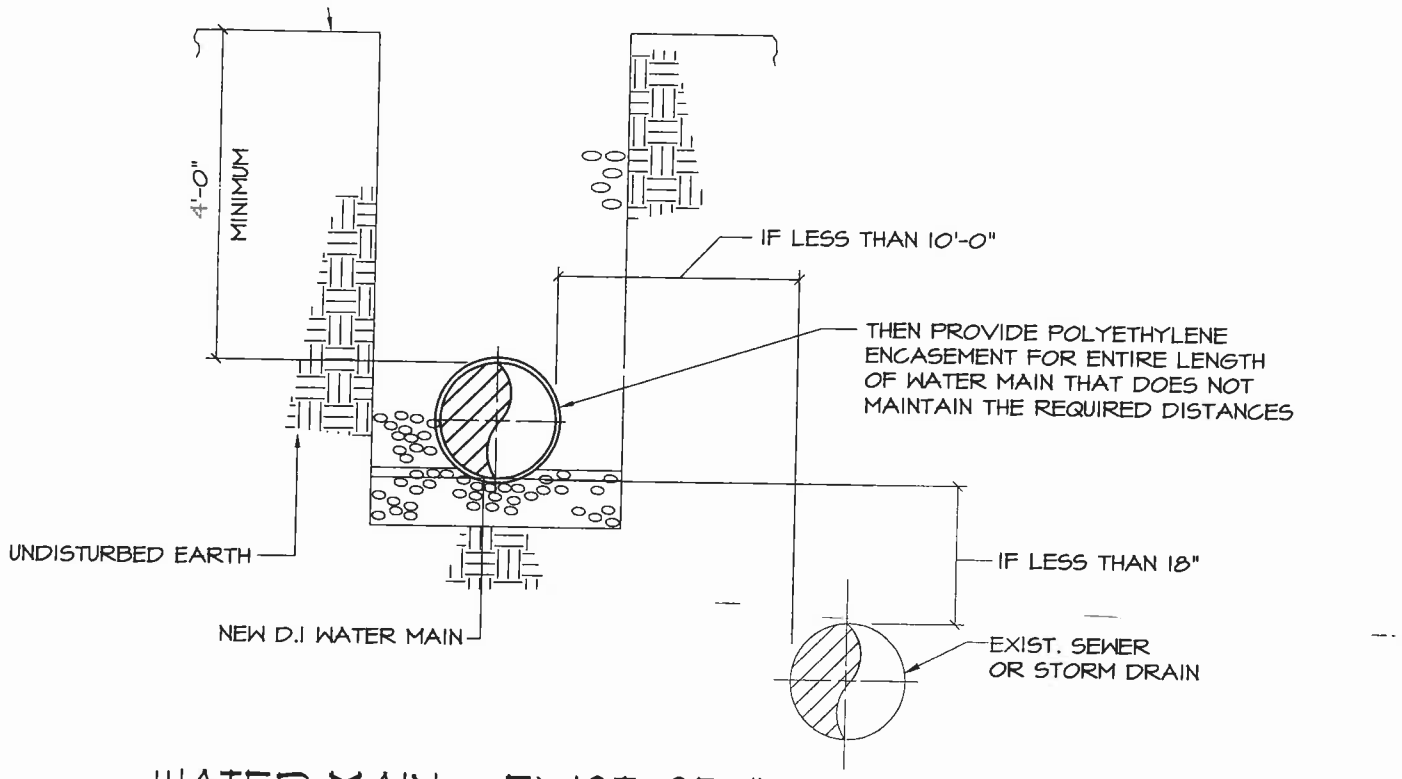
SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.
▲ 4 SOUTH FOURTH STREET P.O. BOX 32 READING, PA 19603 (610) 373-6667
△ 1851 WEST END AVE P.O. BOX 389 POTTSVILLE, PA (717) 628-5655

COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE SEWER CROSS UNDER DETAIL				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-10
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		





WATER MAIN - EXIST. SEWER PARALLEL DETAIL

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.
▲ 4 SOUTH FOURTH STREET P.O. BOX 32 READING, PA 19603 (610) 373-6667
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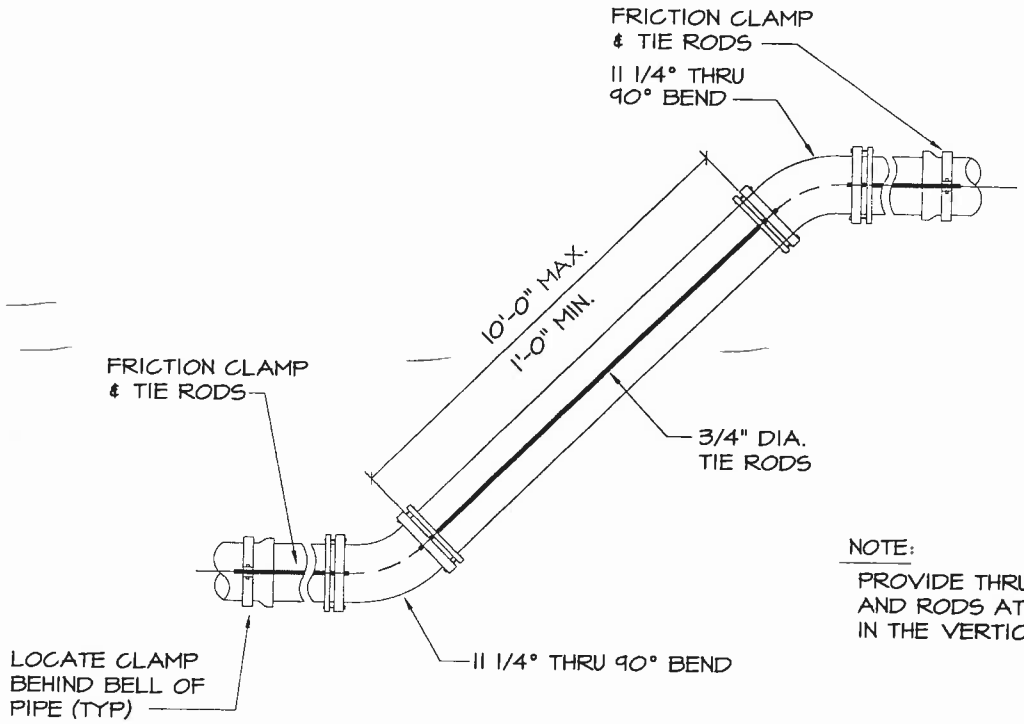
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE
WATER MAIN PARALLEL TO EXIST. SEWER

ISSUE DATE:	REV.	DRAWING NO.
1/23/98	0	W-11

DRAWN BY	CHECKED	APPROVED	PROJ. MGR.	SCALE:
BAE	SMITH	DJC	RSM	NONE



NOTE:

PROVIDE THRUST CLAMPS WITH LUGS AND RODS AT EACH ELBOW LOCATED IN THE VERTICAL PLANE

THRUST CLAMPING DETAIL
(FOR VERTICAL APPLICATIONS)

SCALE: NONE

ENTECH Engineering Inc.
ENTECH Architectural Services Inc.
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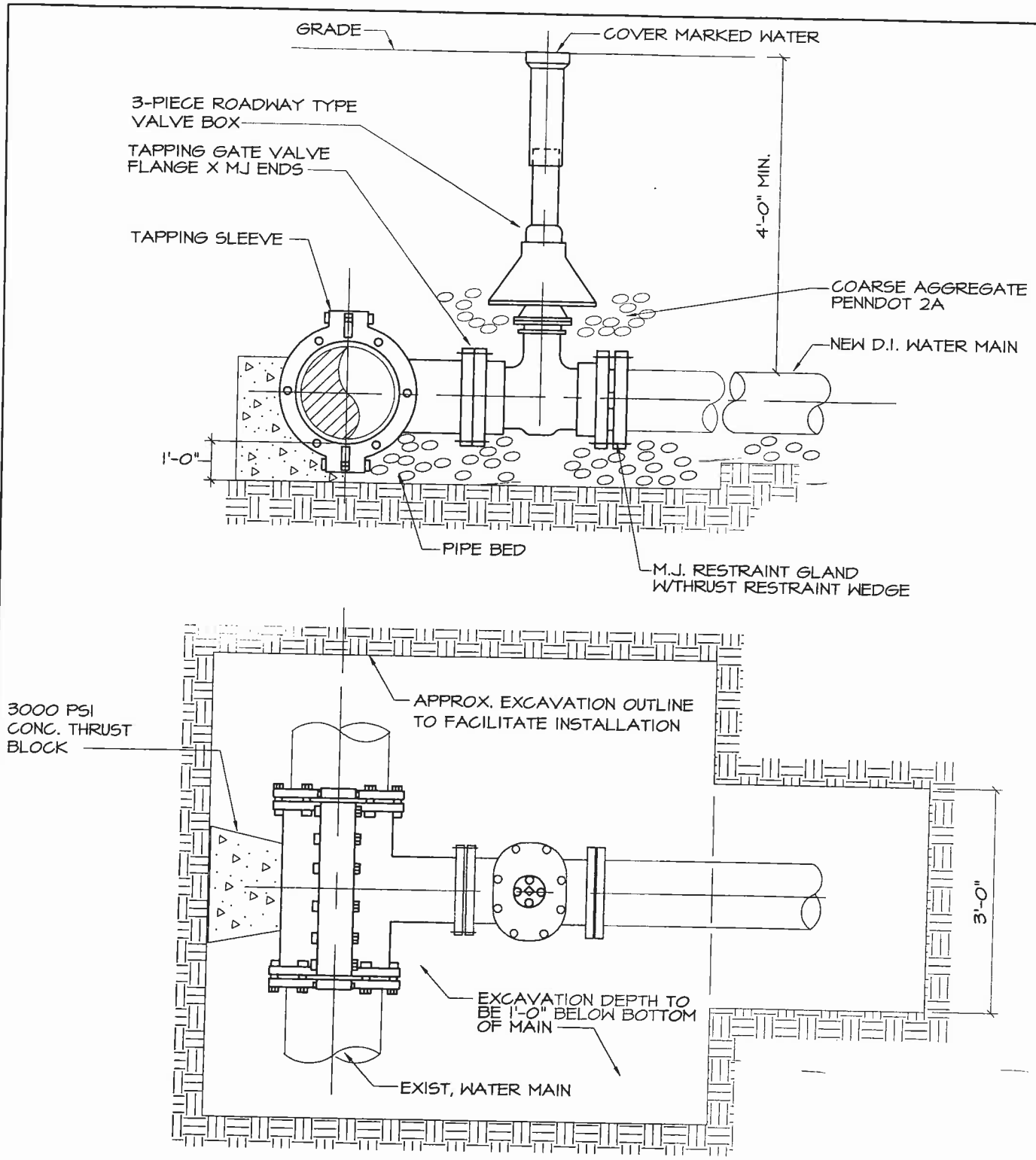
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE THRUST CLAMPING DETAIL				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-12
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



TAPPING GATE VALVE & TRENCH DETAIL

SCALE: NONE

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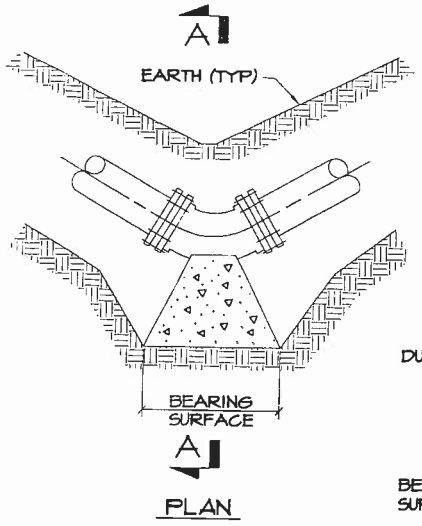
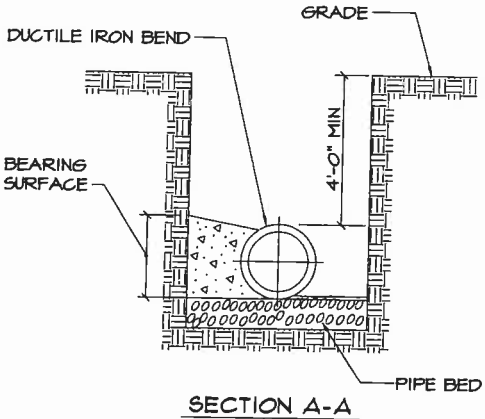
COLLEGE TOWNSHIP WATER AUTHORITY

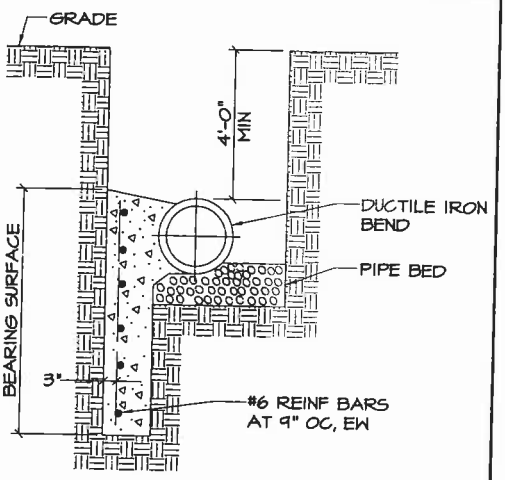
INFRASTRUCTURE TAPPING GATE VALVE & TRENCH DETAIL				ISSUE DATE: 1.23.98	REV. 0	DRAWING NO. W-13
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



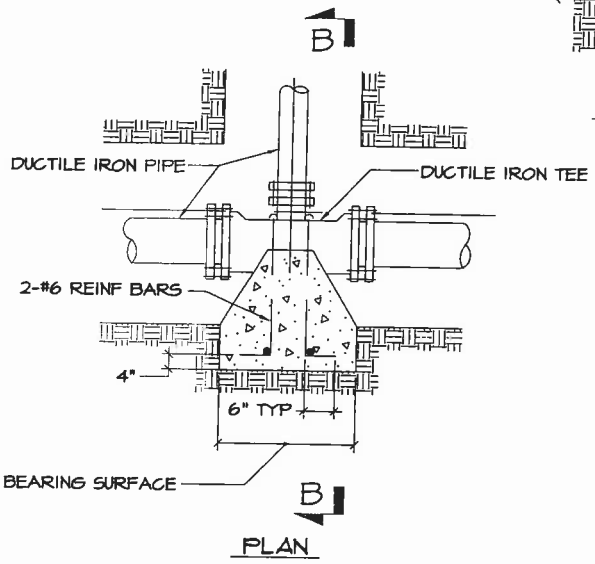
PLAN



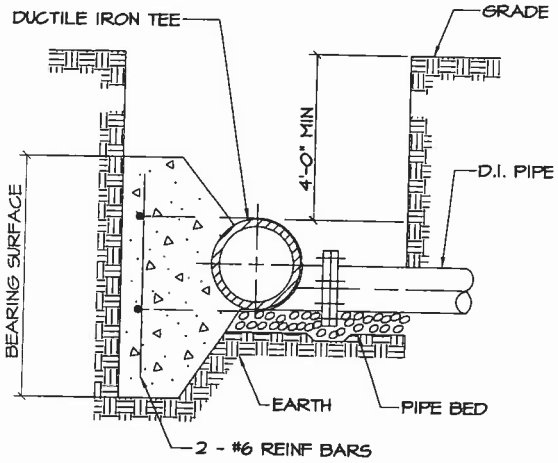
SECTION A-A



ALTERNATE SECTION A-A



PLAN



SECTION B-B

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT THE END OF 28 DAYS.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. PROVIDE CONC THRUST BLOCKS FOR FIRE HYDRANTS. REFER TO EXIST / NEW HYDRANT DETAILS.
4. INSTALL CONCRETE THRUST BLOCKS AT EACH ELBOW, TEE AND CAPPED OR VALVED END FITTINGS LOCATED IN THE HORIZONTAL PLANE.
5. FOR BEARING SURFACE REQUIREMENTS REFER TO DWG. W-15.

THRUST BLOCKING DETAILS

SCALE: NONE

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COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE THRUST BLOCKING				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-14
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		

MINIMUM SQUARE FEET OF BEARING SURFACE REQUIRED FOR HORIZONTAL THRUST BLOCKING AND VERTICAL THRUSTS DOWNWARD

NOTE: WORK THIS SCHEDULE WITH THRUST BLOCK DETAILS ON DWG. W-14

PIPE SIZES →	6" AND 8"				10" AND 12"			
TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	DEGREE BEND OR DEFLECTION				DEGREE BEND OR DEFLECTION			
	11 1/4°	22 1/2°	45°	90°	11 1/4°	22 1/2°	45°	90°
SAND 1 TON/SQ FT SOFT CLAY 1 TON/SQ FT	1.50	3.00	6.00	12.00	3.00	6.00	12.00	24.50
SAND & GRAVEL 2 TON/SQ FT	1.00	1.50	3.00	6.00	1.50	3.00	6.00	12.00
CLAY 3 TON/SQ FT	1.00	1.00	2.00	4.00	1.00	2.00	4.00	8.00
SOFT ROCK 5 TON/SQ FT	1.00	1.00	1.00	2.50	1.00	1.00	2.50	5.00
ROCK 20 TON/SQ FT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

MINIMUM SQUARE FEET OF BEARING SURFACE REQUIRED FOR HORIZONTAL THRUST BLOCKING AND VERTICAL THRUSTS DOWNWARD

PIPE SIZES →	14" AND 16"				18" AND 20"			
TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	DEGREE BEND OR DEFLECTION				DEGREE BEND OR DEFLECTION			
	11 1/4°	22 1/2°	45°	90°	11 1/4°	22 1/2°	45°	90°
SAND 1 TON/SQ FT SOFT CLAY 1 TON/SQ FT	5.50	11.00	21.50	43.00	8.50	16.50	33.00	66.00
SAND & GRAVEL 2 TON/SQ FT	2.50	5.50	11.00	21.50	4.00	8.50	16.50	33.00
CLAY 3 TON/SQ FT	2.00	3.50	7.00	14.00	3.00	5.50	11.00	22.00
SOFT ROCK 5 TON/SQ FT	1.00	2.00	4.50	8.50	1.50	3.50	6.50	13.00
ROCK 20 TON/SQ FT	1.00	1.00	1.00	2.00	1.00	1.00	1.50	3.50

THRUST BLOCKING SCHEDULE OF DIMENSIONS

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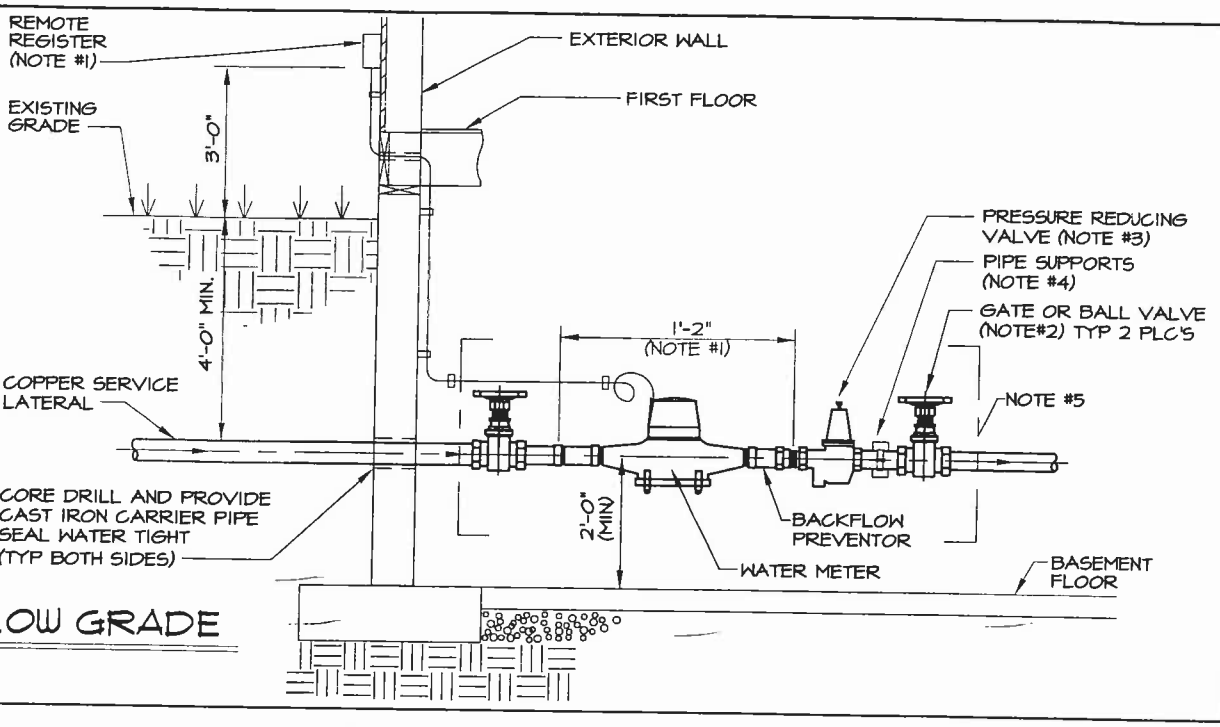
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE
THRUST BLOCK SCHEDULE

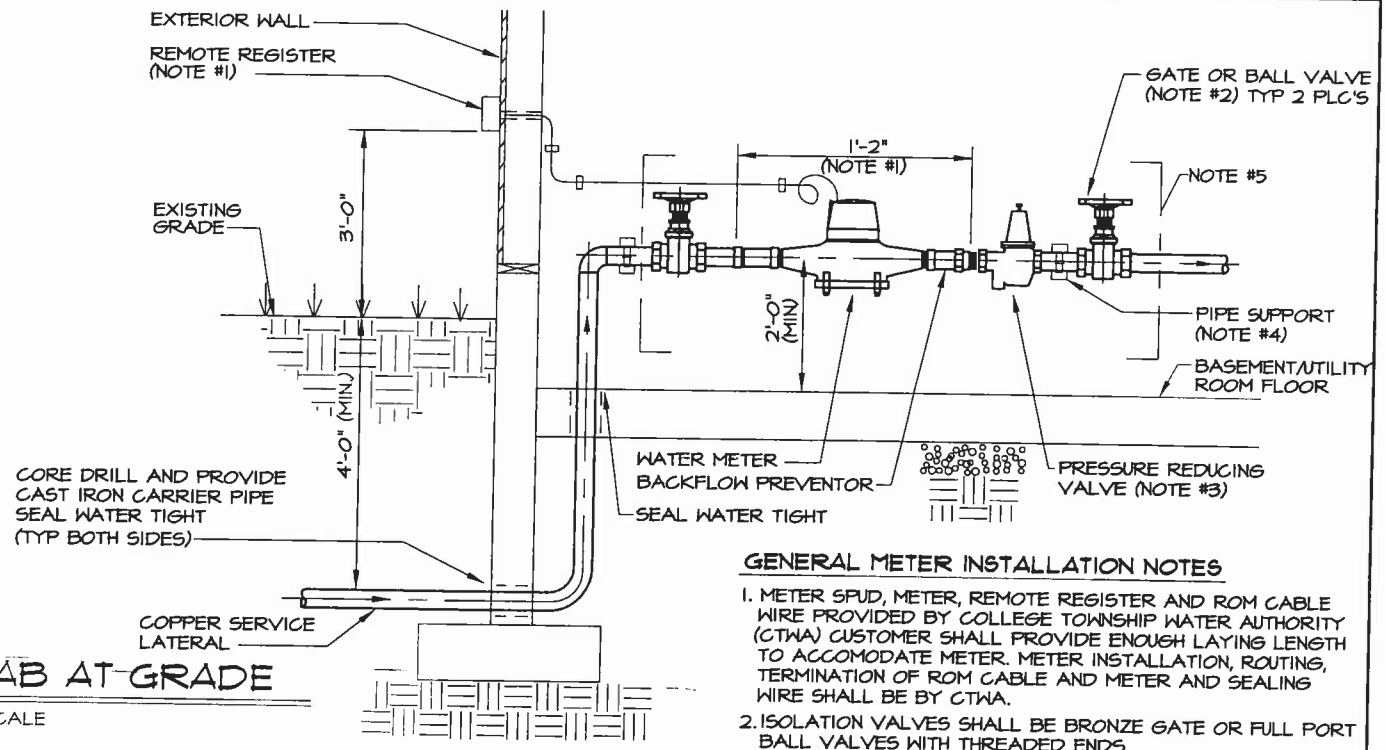
ISSUE DATE:	REV.	DRAWING NO.
1/23/98	0	W-15

DRAWN BY	CHECKED	APPROVED	PROJ. MGR.	SCALE:
BAE	SMITH	MJD	RSM	NONE



SLAB BELOW GRADE

NO SCALE



SLAB AT-GRADE

NO SCALE

GENERAL METER INSTALLATION NOTES

1. METER SPUD, METER, REMOTE REGISTER AND ROM CABLE WIRE PROVIDED BY COLLEGE TOWNSHIP WATER AUTHORITY (CTWA) CUSTOMER SHALL PROVIDE ENOUGH LAYING LENGTH TO ACCOMODATE METER. METER INSTALLATION, ROUTING, TERMINATION OF ROM CABLE AND METER AND SEALING WIRE SHALL BE BY CTWA.
2. ISOLATION VALVES SHALL BE BRONZE GATE OR FULL PORT BALL VALVES WITH THREADED ENDS.
3. PROVIDE PRESSURE REDUCER WHERE SYSTEM PRESSURE EXCEEDS 50 PSI
4. PROVIDE COPPER PLATED PIPE SUPPORTS ANCHORED FROM STRUCTURE
5. MAINTAIN ADEQUATE CLEARANCE AROUND METER INSTALLATION TO FACILITATE FUTURE MAINTENANCE BY CTWA.

STANDARD PROCEDURE FOR INSTALLATION OF RESIDENTIAL WATER METER

SCALE: NONE

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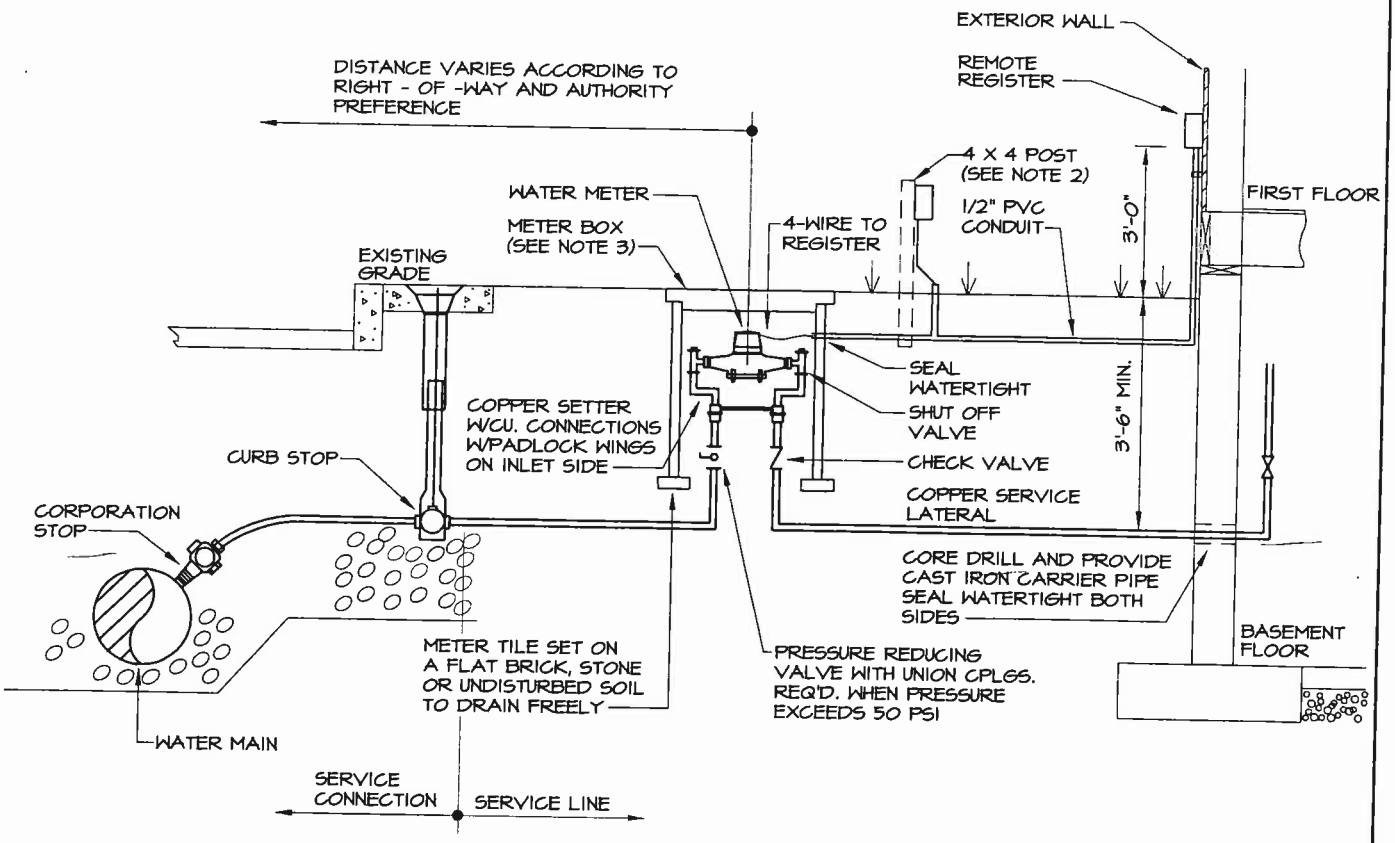
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE RESIDENTIAL METER INSTALLATION DETAIL				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-16
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		



GENERAL METER INSTALLATION NOTES

1. METER SPUD, METER, REMOTE REGISTER AND ROM CABLE WIRE PROVIDED BY COLLEGE TOWNSHIP WATER AUTHORITY (CTWA). CUSTOMER SHALL PROVIDE ENOUGH LAYING LENGTH TO ACCOMODATE METER. METER INSTALLATION, ROUTING, TERMINATION OF ROM CABLE AND METER AND SEALING WIRE SHALL BE BY CTWA
2. IF PIT IS MORE THAN 100' FROM HOUSE A 4" X 4" POST MUST BE SET NEXT TO PIT AND BURIED AT LEAST 2' AND BE 2' OUT OF GROUND (MIN)
3. CAST IRON METER BOX COVER SHALL BE ALLEGHENY FOUNDRY CO. TOP FLANGE CIRCULAR TYPE FRAME NO. 168 COVER NO. 169X OR APPROVED EQUAL
4. 18" I.D. TILE OR PVC FOR USE WITH 5/8" METER. 24" I.D. TILE OR PVC FOR USE WITH 1" METER. SQAURE METER PIT MAY BE USED IF LOCAL PREFERENCE EXISTS
5. SERVICE LINE FROM CURB STOP TO HOME AND PRESSURE REDUCING VALVE BY CUSTOMER

STANDARD PROCEDURE FOR INSTALLATION OF RESIDENTIAL OUTSIDE WATER METER SETTING

SCALE: NONE

THIS SETTING REQUIRED WHEN DISTANCE FROM HOUSE TO CURB LINE IS 200' OR GREATER

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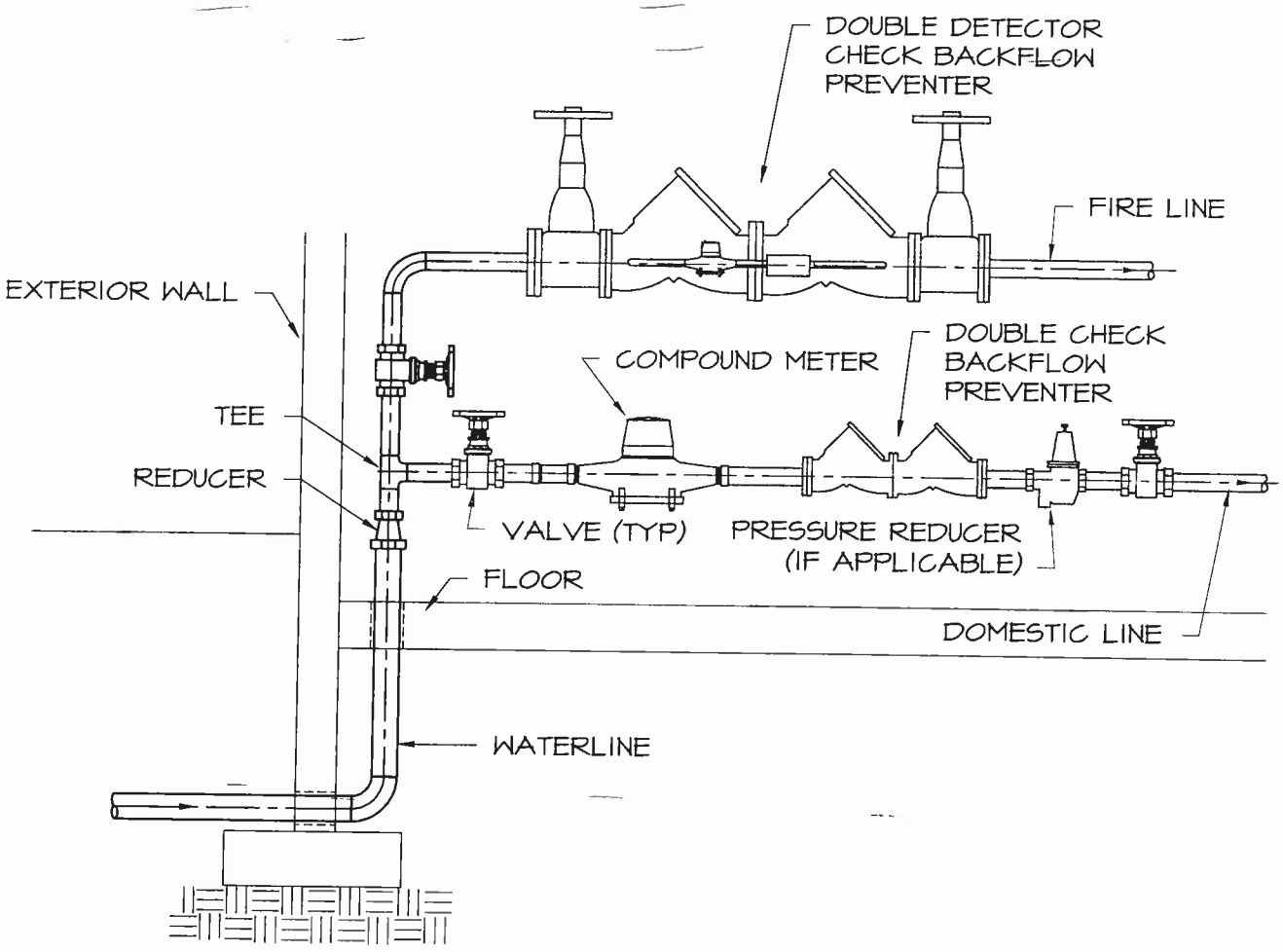
COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE RESIDENTIAL OUTSIDE METER SETTING DETAIL				ISSUE DATE: 1/23/98	REV. 0	DRAWING NO. W-17
DRAWN BY BAE	CHECKED SMITH	APPROVED MJD	PROJ. MGR. RSM	SCALE: NONE		

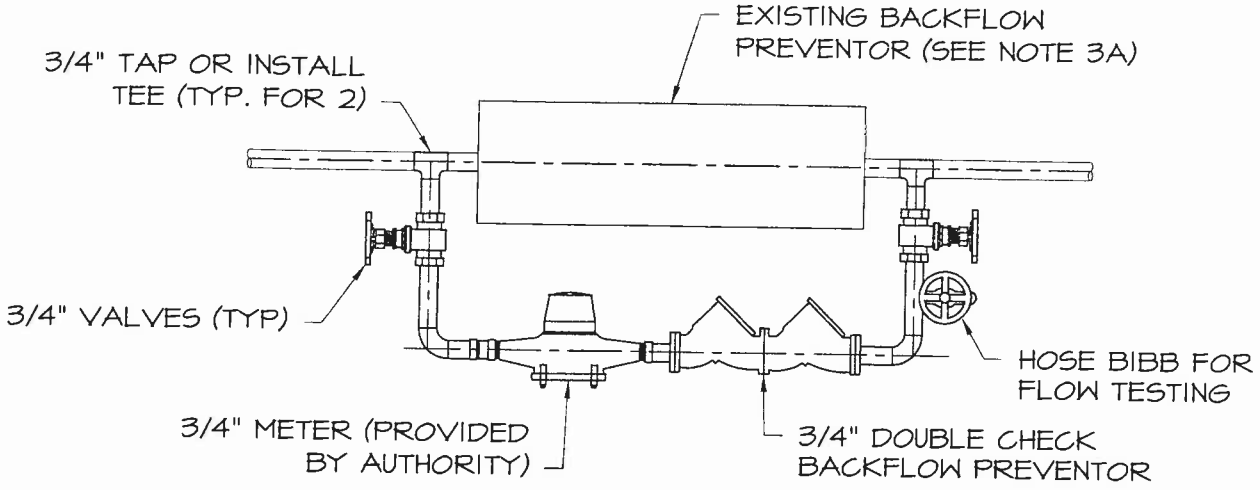


STANDARD FOR FIRE/DOMESTIC SPLIT

SCALE: NONE

COLLEGE TOWNSHIP WATER AUTHORITY

INFRASTRUCTURE FIRE/DOMESTIC METER INSTALLATION DETAIL				ISSUE DATE: 6/18/03	REV. 0
DRAWN BY JWB	CHECKED .	APPROVED MJD	PROJ. MGR. .	SCALE: NONE	DRAWING NO. **W-18**



STANDARD FOR RETROFITTING EXISTING FIRE SERVICES WITH A FLOW DETECTION METER

SCALE: NONE

THESE ARE GUIDELINES FOR RETROFITTING EXISTING FIRES SERVICE LINES WITH A FLOW DETECTOR METER.

1. DETERMINE WHETHER THE FIRE SPRINKLER SYSTEM IS WET OR DRY.

2. IF THE SYSTEM IS A WET SYSTEM, THEN A DETECTOR METER MUST BE INSTALLED AROUND THE EXISTING BACKFLOW PREVENTER AS SHOWN ABOVE.
   A. THE BACKFLOW PREVENTER ON A FIRE SPRINKLER SYSTEM MUST BE A DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY MEETING AWWA C510, UNLESS THE SYSTEM HAS AN EXISTING SINGLE CHECK VALVE. THEN AN ADDITIONAL SINGLE CHECK VALVE IS REQUIRED.

3. SINCE THE PLUMBING FOR THE EXISTING FIRE SERVICE LINES ARE UNIQUE, A SITE MEETING SHALL BE SCHEDULED WITH THE CUSTOMER, PLUMBING CONTRACTOR AND CTWA TO AGREE UPON A PLUMBING DESIGN FOR THE RETROFIT OF A DETECTOR METER.
   A. A SKETCH OF THE FIRE SERVICE LINE AND PROPOSED RETROFIT SHALL BE CREATED.
   B. ANY SHUT DOWN OF THE FIRE SERVICE LINE, SHALL BE COORDINATED WITH THE CUSTOMER.

4. THE BASIC GUIDELINES FOR THE DETECTOR METER RETROFIT ARE:
   A. WET TAP OR INSTALL A TEE UPSTREAM AND DOWNSTREAM OF THE EXISTING BACKFLOW PREVENTER.
   B. INSTALL A ISOLATION VALVE ON THE BRANCH OF EACH OF THE TEES
   C. PIPE MATERIAL SHALL BE IN ACCORDANCE WITH THE AUTHORITY'S SPECIFICATIONS
   D. INSTALL A WATER METER, PROVIDED BY THE AUTHORITY.
   E. INSTALL A DOUBLE CHECK BACKFLOW PREVENTER AFTER THE WATER METER.
   F. INSTALL A HOSE BIBB TO CHECK FOR PROPER OPERATION OF THE WATER METER.

				COLLEGE TOWNSHIP WATER AUTHORITY	
INFRASTRUCTURE RETROFIT FIRE SERVICE W/ A FLOW DETECTION METER				ISSUE DATE: 8/6/03	REV. 0
DRAWN BY JWB	CHECKED .	APPROVED KAM	PROJ. MGR. KAM	SCALE: NONE	DRAWING NO. **W-19**