

**TOWN OF MILLWOOD  
WATER SYSTEM  
STANDARD SPECIFICATIONS**

**GENERAL REQUIREMENTS**

**Section 01020 - Page 1**

**1.00 GENERAL**

**1.01 APPLICABILITY**

These Standard Specifications shall apply to all water system construction within the Town of Millwood. Owner shall refer to the Town of Millwood or a private developer as determined by the Town. Engineer shall refer to the Town of Millwood, its engineering representative, or a developer's engineer as determined by the Town.

These Standard Specifications are not intended for use as a part of construction contract documents.

**1.02 SPECIFICATION STRUCTURE:**

**1. Format**

These specifications are organized in the format promulgated by the Construction Specification Institute (CSI Format). This format assigns permanent numbers to all Divisions and Sections and so far as possible assigns all products, processes, activities and construction requirements permanent places in the specifications. A number is assigned which generally will not change from project to project. Division, Section and Subsection numbers which are not required are omitted from the Specifications.

**2. Index**

All sections required for a complete contract appear in the index. Sections not required are omitted. Bidders and Contractors should check sections present against the index to assure the presence of all required sections of the contract.

**3. Work**

No attempt has been made in these specifications or plans to segregate work covered by any trade or subcontractor under one specification. Such segregation and establishment of subcontract limits shall be solely a matter of specific agreement between the Contractor and his Subcontractors and shall not be based upon an inclusion, segregation or arrangement in or of these specifications. The Contractor and Subcontractor in each case is warned that work included in any subcontract may be divided between several general specifications and that each general specification or subhead of the Technical Specifications may include work covered by two or more subcontracts in excess of any one subcontract.

**1.03 COORDINATION REQUIRED:**

The Contractor shall provide adequate notice to the Owner regarding times when shutting down existing utilities is required. The Contractor shall use extreme care when working across, under or near existing water and sewer utilities of the Owner. The Contractor is responsible for any damage to existing utilities and appurtenances.

**1.04 PRECONSTRUCTION CONFERENCE:**

A preconstruction conference between the Contractor, Owner and applicable regulatory or funding agencies shall be scheduled prior to start of construction. The Contractor shall submit his proposed detailed schedule for the work on or before the date of the preconstruction conference. The date, time and location of the preconstruction conference shall be as mutually agreed to by the attending parties.

**1.05 WEEKLY CONSTRUCTION MEETINGS:**

Weekly construction meetings involving the Contractor's on-site superintendent, the Owner and others as necessary may be held on-site at a day and time agreed upon by the parties.

**1.06 CONSTRUCTION STAKING:**

Construction staking shall be provided by the Contractor. The Contractor shall set an adequate number of construction stakes to insure that all structures, pipe and appurtenances are installed as shown. Bench mark elevation for vertical control will be provided by the Owner where required.

The Contractor shall be responsible for all construction staking required to re-establish roadway sections. The Contractor shall be responsible to provide preconstruction surveying and documentation of existing roadways to facilitate re-establishing street sections.

All survey work shall be done by a surveyor registered to practice in the State of Washington. All survey work shall be considered incidental to the other work and a separate payment will not be made.

Survey work shall include but not be limited to:

1. Setting and maintaining 2" X 2" offset hubs with a tack at maximum 50-foot intervals for water and/or sewer line and grade.
2. Setting and maintaining road grade stakes at 50-foot intervals with one at the center and at each edge of the road. These stakes shall be set for subgrade and for the top of the crushed surfacing top course. A stake is not required at the edge of the road if there are curbs; however, chiseled grade marks are required for the top of the asphalt. Adequate surveying shall be done prior to removal of existing pavement section to facilitate re-establishing street sections.
3. Occasional revisions to road grade may be required to improve drainage. Revisions made in the field to improve drainage shall be considered a normal part of construction surveying and shall be incidental to the project.
4. Setting and maintaining 2" X 2" offset hubs at all water and/or sewer service connections. The stationing, cut to invert, and invert elevation shall be marked on the guard stake.

Alternative methods differing from those described above may be proposed by the Contractor.

**1.07 RECORD DRAWINGS:**

The Contractor shall maintain on site a set of plans for the sole and specific purpose of accurately and promptly recording all changes and modifications in the work as it proceeds. The location, depth and description of all existing utilities, structures and improvements encountered in the work shall also be accurately recorded. Monthly and final payments may be withheld until record drawing information is brought up to date. Final payment will not be released until the Contractor's record drawings are submitted to the Owner and approved.

**1.08 CONSTRUCTION WATER:**

The Contractor shall be responsible for obtaining, transporting and applying such water as is required for proper construction in accordance with the Specifications. Water will be supplied by the Owner only at approved locations. Filling of construction or maintenance equipment shall be done at the Owner's designated filling station located at the back of the fire station. Water for use in compacting backfill may be obtained at appropriate fire hydrants with prior approval of the Owner. The Contractor shall provide and utilize a water meter and backflow preventer in accordance with and as approved by the Owner. The Contractor shall contact the Owner for other requirements prior to obtaining Town water.

**1.09 CONTRACTOR SITE INVESTIGATION:**

By submitting a Bid Proposal for this work, the Contractor acknowledges that he has satisfied himself as to the nature and location of the work, and the general and site-specific conditions, particularly those bearing upon the availability of transportation, disposal, handling and storage of materials, the availability of labor, water, electric power, access, equipment and material deliveries, uncertainties of weather, river stages or other physical conditions at the site, the conformation and conditions of the ground, including the potential for the existence of rock and/or groundwater, the character of such equipment and materials needed to prosecute the work, and all other matters of any nature which may affect the work under this Contract or the cost thereof.

The Contractor acknowledges that he has satisfied himself as to the character of surface and subsurface materials to be encountered from his own site inspection, information from exploratory work conducted by the Owner (if any), and the information in the Drawings and Specifications. Failure by the Contractor to acquaint himself with the site and the available information shall not relieve him from responsibility for properly determining the difficulty and cost of performing the work in accordance with the Contract Documents and good construction practice.

The Contractor warrants that as a result of his site investigation and examination of the above data that he can and will perform the work in accordance with the Contract Documents and good construction practice. The Owner assumes no responsibility for any representations made by any of its officers or agents prior to or during the work.

**1.10 SUBSURFACE AND SITE INFORMATION:**

All bidders shall make their own assessment and/or investigations of the project site as to subsurface and soils information, including use of test pits or borings if desired. Any field subsurface investigations by bidders shall be approved in advance by the Owner.

If borings are available, it is acknowledged that they were prepared solely for the Engineer's and Owner's use. It is made available only for the convenience of the Bidders/Contractor and is not in any way intended to warrant that any specific condition or conditions exist at the site.

The Bidder/Contractor acknowledges by submission of a bid that the Owner is not responsible for any decisions made by the Bidder/Contractor on the basis of this information, or for any damages, injuries, claims or actions which may result from the Contractor's use or interpretation of this information.

#### 1.11 EXISTING UTILITIES LOCATION AND PROTECTION:

The descriptions and locations of known existing utilities shown on the Drawings are rough approximations only and may not be sufficiently accurate to plan construction operations. Other utilities may exist in the work area that are not shown on the Drawings. Information on known existing utilities and structures shown on the Drawings is provided for the convenience of the Contractor only, and no responsibility is assumed for its accuracy or completeness. The Owner shall not be responsible to the Contractor for damages, claims or expenses incurred by the Contractor as a result of actual utility locations being different than as shown on the Drawings, or the existence of utilities not shown.

At locations where the Contractor's operations could result in damage, disruption, loss, expense or inconvenience of railway, telephone, telegraph, power, oil, gas, water, sewer, irrigation, cable service, or other private or municipal systems, the operations shall be suspended until adequate arrangements and coordination necessary for the protection thereof have been made by the Contractor.

Prior to start of work, and prior to construction staking, the Contractor shall contact all utility owners to field locate and mark such utilities. It shall be the Contractor's responsibility to preserve and protect utility field location markings and to record such locations on the Record Drawings. Under no circumstances is the Contractor to expose any underground utility before obtaining permission to do so from the utility owner.

The Contractor shall be solely and directly responsible to the utility owner and/or operator for any damage, disruption, injury, expense, loss, inconvenience, suits, actions, or claims resulting from the affect of the work under this Contract on any field-located utilities. In the event of breakage or disruption of any utilities, the Contractor shall immediately notify the proper authority and cooperate with same in repair and restoration of service and bear such costs of repair and restoration a may result.

#### 1.12 EXISTING STRUCTURES AND IMPROVEMENTS:

The Contractor shall take necessary precautions to prevent damage or disturbance to existing structures and improvements, whether above or below ground. Structures and improvements shown on the Drawings are intended as a general guide only; other structures and improvements may exist which are not shown.

Where existing structures or improvements, including but not necessarily limited to buildings, fences, shrubs, trees, lawns, landscaping, crops, drives, walks, pavement, or other surfaces are

disturbed or damaged as a result of the Contractor's operations, the Contractor shall restore, repair or replace such structures or improvements to their original condition to the satisfaction of the Owner, and affected property owner. The Contractor shall notify the Owner immediately of any such damage or disruption, and make repairs promptly, as and when approved by the Owner. Unless the Contract Documents specify otherwise, all responsibility for protection, repairs, claims or expenses resulting from the Contractor's operations affecting existing structures and improvements shall be solely the Contractor's and no additional payment will be made therefore.

If existing structures and/or improvements are encountered which will prevent further construction and which are not properly shown on the Drawings, the Contractor shall notify the Engineer immediately before continuing construction in order that the Engineer may evaluate the possibility of making field revisions to the work to avoid or minimize conflict with such existing structures or improvements. If the Contractor fails to make such notification, and proceeds with construction despite the interference, he shall do so entirely at his own risk and expense.

The Contractor shall provide temporary drainage methods and/or protection when his operations in any way disrupt or interfere with existing drainage facilities or patterns. The adequacy and timeliness of such temporary drainage methods and/or protection shall be the sole responsibility of the Contractor, as shall the liability for claims and/or expenses resulting from its inadequacy.

**1.13 LIMITS OF WORK:**

Unless indicated otherwise on the Drawings or in these Specifications, the Contractor shall limit all operations, including material storage and project access, to the easements and/or rights-of-way indicated on the Drawings or described in the Specifications, except as permitted by other property owners in separate agreements with the Contractor.

**1.14 EXISTING MONUMENTS AND SURVEY MARKERS:**

The Contractor shall preserve, protect and/or replace all existing federal, state, county, municipal or private land monuments and survey markers in the work area, including property corners. The Contractor shall comply with all state and federal laws pertaining to the disturbance, removal and replacement of survey monuments, points or markers. The Contractor shall provide the Owner with sufficient documentation that an appropriate search has been conducted to identify any local survey markers which could be disturbed prior to the start of construction. This documentation shall include but is not limited to copies of letters or other forms of request for information from local surveyors or governmental agencies regarding the search for survey monuments, etc. If such monuments or markers are to be disturbed by the Contractor's operation, he shall complete such applications and referencing as required by law for the removal of survey monuments or markers. The Contractor shall provide the Owner with a copy of the application sent to the appropriate government agency. The Contractor shall be responsible to replace such monuments and survey markers and complete the permit process at his own expense at no additional cost to the Owner. The Contractor shall provide the Owner with a copy of the completed permit he has returned to the appropriate government agency once the monuments and survey markers are replaced.

**1.15 TEMPORARY CONSTRUCTION UTILITIES AND FACILITIES:**

The Contractor shall make arrangements for temporary electrical power, telephone, and sanitary

facilities as may be required for the work and/or by federal, state or local regulations. Unless specifically indicated otherwise in the Drawings or Specifications, all costs for such utilities and facilities shall be borne by the Contractor, and no additional payment will be made therefor. All temporary utilities and sanitary facilities shall comply with applicable codes, and safety, health, and other agency regulations as applicable.

**1.16 ACCIDENT REPORTS:**

In the event of any accident, injury or damage as a result of the work of this Contract, or at or near the project site, the Contractor shall immediately notify the Owner by telephone, messenger or in person. The Contractor shall promptly follow up such verbal notification with a written report of the occurrence to the Owner giving full details and statements of witnesses. If a claim is made by anyone against the Contractor or any subcontractor as a result of such an occurrence, the Contractor shall promptly report the facts in writing to the Owner, including full details of the claim.

**1.17 SAFETY:**

The Contractor shall develop and maintain for the duration of this project a safety program that will effectively incorporate and implement all federal, state and local safety requirements. The Contractor shall appoint a qualified employee to supervise and enforce such a program.

The activities of the Owner in conducting reviews and inspections of the materials, performance, and installed work of the Contractor is not intended to constitute review and approval of the adequacy of the Contractor's safety supervisor, program or practices in, on or near the construction site.

The Contractor shall maintain at his field shop or office all such safety equipment and supplies as required for the work and by regulations, including emergency and first aid supplies.

The Contractor shall do all work necessary to protect the public and project persons from hazards, including but not limited to surface irregularities in sidewalks, paths, driveways, and roads, excavations, slippery surfaces, electrical conductors and equipment, tools and construction vehicles or equipment. Barricades, fencing, lights and signs shall be installed and maintained to adequately provide such protection in accordance with regulations and as required by the Owner.

All work and all completed construction shall be in accordance with applicable governing regulations and authorities, especially in regards to excavations, ladders, platforms, structure openings, scaffolding, lagging, machinery guards, and electrical items.

Safe access shall be provided at all times for local, state or federal authorities and inspectors, as well as for the Owner and authorized personnel.

**1.18 TRAFFIC MAINTENANCE, CONTROL AND SAFETY:**

The Contractor shall be solely responsible for traffic maintenance, control and safety, and shall comply with all ordinances and regulations of the applicable federal, state and/or local authorities regarding the closing, restricting, crossing, detouring upon or working within public roads, streets and highways. No public or private road or driveway shall be closed except by express permission of the governing authority or property owner as applicable. All work shall be planned and conducted in

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such a fashion as to minimize disruption of traffic and access to adjacent public, private or commercial properties.

The convenience of the general public and the protection of persons and property shall be the primary consideration and adequate planning, arrangements and scheduling shall be the Contractor's responsibility to assure such convenience and protection.

The Contractor shall, at his own expense, (unless a specific bid item is provided) provide flagging and maintain suitable bridges, detours, traffic control and other temporary items for accommodation of traffic. The Contractor shall obtain Owner approval of all road closures and detour routes. The Contractor shall be solely responsible for notifying such authority or property owners prior to performing any operations which may affect public or private rights-of-way.

Where traffic will pass over trenches before they are resurfaced they shall be maintained in a firm and smooth condition that will allow normal vehicular traffic. Temporary access driveways shall be provided where required. Clean-up shall be accomplished immediately after backfill and the site shall be kept free of debris and material at all times.

Access for fire fighting equipment shall be provided at all times and the Contractor shall keep the local fire protection authorities informed at all times of the location of construction operations and fire lanes.

The Contractor shall also notify the authorities in charge of any municipal, private, or school transportation systems at least 48 hours in advance of road closures or detours that will force a change in the regular routing of the transportation system.

Other specific requirements regarding temporary surfaces, access, site conditions, and traffic control may be included in other Sections of these Specifications.

**1.19 SITE RESTORATION AND CLEAN-UP:**

All areas affected by the Contractor's operations shall be kept neat and reasonably free of debris and waste materials. Upon completion of the work in any particular area the Contractor shall return all surfaces to their original or better condition, and remove all excess materials and debris. All areas shall be graded smooth, to blend with abutting undisturbed areas, and with drainage characteristics similar to prior to disturbance. All existing drainage ditches and culverts shall be carefully and fully restored to their original condition and function or better, promptly after work in the area is sufficiently completed.

**1.20 DUST PREVENTION:**

The Contractor shall take whatever measures are necessary to prevent dust in the work areas, including periodic application of water or dust preventative material. Environmental regulations regarding dust prevention shall be adhered to.

**1.21 POLLUTION CONTROL:**

The Contractor shall be responsible for the prevention of pollution (including that caused by silt or

other run-off) of surrounding land, waterways, groundwater, or ecosystems. Should the Contractor deem it necessary to dispose of any pollutant, as defined by the U.S. Environmental Protection Agency, and/or Washington State Department of Ecology, he shall obtain the written authorization of the Owner, and local, county, state, and federal regulating agencies regarding such matters, at his own expense.

**1.22 LABOR STANDARDS AND EQUAL OPPORTUNITY REQUIREMENTS:**

The Contractor's attention is directed to applicable Contract requirements regarding labor standards, equal opportunity, affirmative action, and related federal and state requirements. These requirements are an integral part of this Contract. Failure to comply with these requirements, including timely submission of reports and documentation may result in delay of Contract payments, in addition to other remedies available to the Owner.

**1.23 THIRD-PARTY BENEFICIARY CLAUSE (IF REQUIRED BY FUNDING AGENCY OR TOWN OF MILLWOOD):**

All parties agree that the State of Washington shall be, and is hereby named as an express third-party beneficiary of this contract and any subsequent contracts or subcontracts, with full rights as such. This clause shall also be included in all contracts between the Contractor and his (or her) subcontractors.

**1.24 ARCHAEOLOGICAL DISCOVERIES AND HISTORIC PRESERVATION:**

The Contractor shall adhere to the National Historic Preservation Act of 1966 and 36 CFR 800 which provide for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources") and fair compensation to the Contractor for delays resulting from such cultural resources investigations.

In the event that potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:

1. The Owner shall issue a Work Suspension Order directing the Contractor to cease all construction operations at the location of such potential cultural resources find.
2. If archaeological findings include human remains, the Owner shall contact a qualified archaeologist in consultation with the State Historic Preservation Officer (SHPO) to evaluate the remains.
3. Such Work Suspension Order shall be effective until such time as a qualified archaeologist can be called by the Owner to assess the significance of these potential cultural resources and make recommendations to the State Historical Preservation Officer. If the archaeologist, in consultation with State Historic Preservation, determines that the potential find is a significant cultural resource, the Owner shall extend the duration of the Work Suspension Order.
4. Suspension of work at the location of the find shall not be grounds for any claim by the Contractor unless the suspension extends beyond the contract working days allowed for the

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project, in which case the Owner will make an adjustment for increased cost of performance of the contract.

**1.25 CONTRACTOR WORK HOURS:**

Except in connection with the safety and protection of persons, property or the work, no work shall be done between the hours of 6:00 p.m. and 7:00 a.m., nor on Saturdays, Sundays or legal holidays, without the Owner's written consent given after the Contractor's prior written request submitted to the Owner.

**1.26 ABANDONMENT OF EXISTING PIPE:**

Abandonment of 3" and larger water, sewer, drain or other buried pipe shall mean plugging with concrete all pipe where cut or broken open (including but not necessarily limited to open pipe ends exposed during construction), or removal of the pipe from the ground. All concrete plugs shall fully seal the opening, shall extend at least 1 ft. into the pipe from the opening, and shall effectively prevent future subsidence of soil above the pipe opening.

END OF SECTION



**1.00 GENERAL**

The Contractor shall be responsible for conducting his work and operations in accordance with all pertinent codes and regulations, latest revisions, including but not necessarily limited to the following:

- American Concrete Institute (ACI)
- American Institute of Steel Construction (AISC)
- American Plywood Associations (APA)
- American Public Works Associations (APWA)
- American Society for Testing and Materials (ASTM)
- American Water Works Association (AWWA)
- Concrete Reinforcing Steel Institute (CRSI)
- National Plumbing Code (NPC)
- Underwriter's Laboratory (UL)
- Uniform Building Code (UBC)
- International Conference of Building Officials (ICBO)
- Steel Structures Painting Council (SSPC)
- Western Wood Products Association (WWPA)
- Local Building Code(s)
- Revised Code of Washington (RCW)
- Uniform Plumbing Code (UPC)
- Washington State Energy Code
- National Fire Codes (NFPA)

Special provisions, requirements and/or revisions to this Specification and/or Bid Item(s) may be included in Section 01010 (green pages) and/or on the Drawings or Details.

END OF SECTION



1.00 GENERAL

1.01 DESCRIPTION:

1. Work Included

1. Wherever possible throughout the Specifications, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
2. To ensure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data and review and approval or rejection by the Engineer.

Special provisions, requirements and/or revisions to this Specification and/or Bid Item(s) may be included in Section 01010 (green pages) and/or on the Drawings or Details.

2.00 PRODUCTS

2.01 SHOP DRAWINGS: (See Also General Conditions)

1. Scale Required

Unless otherwise specifically directed by the Engineer, all Shop Drawings shall be accurately drawn to a scale sufficiently large to show pertinent features and method of connection to the work. On all Shop Drawings figure dimensions shall be used as opposed to scaled dimensions.

2. Type of Prints Required

All Shop Drawings shall be submitted in the form of four (4) blue-line or black-line prints of each sheet. Blueprint submittals will not be acceptable.

2.02 MANUFACTURER'S LITERATURE:

1. General

Where the contents of submitted literature includes data not pertinent to the submittal, the portion(s) of the contents being submitted for the Engineer's review shall be clearly indicated.

2. Number of Copies Required

A minimum of four (4) copies are required.

2.03 SAMPLES:

1. Accuracy of Sample

Unless otherwise specifically directed by the Engineer, all samples shall be of the exact article proposed to be furnished.

2. Number of Samples Required

All samples shall be submitted in the quantity required to be returned to the Contractor, plus two to be retained by the Engineer.

2.04 COLORS:

Unless the precise color is specifically described in the Specification, whenever a choice of color or pattern is available in a specified product, accurate color charts shall be submitted to the Engineer for his review and selection.

2.05 SUBSTITUTIONS:

1. Engineer's Approval Required

1. Comply with the requirements of the General Conditions unless modified herein.
2. The Contract is based on the materials, equipment, and methods described in the Contract Documents.
3. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposals.
4. Do not substitute materials, equipment, or methods unless such substitution has been specifically and previously approved for this work by the Engineer.
5. Requests for substitution may be made prior to award of Contract, in which case the bidder shall not be liable for costs of the Engineer's review, or at any time following award of Contract, in which case, however, the Contractor shall be liable for costs as described in Paragraph D below.
6. To obtain acceptance of unspecified items, bidders shall submit requests at least seven days prior to opening of Bids. Requests will be considered only if all data necessary to demonstrate acceptability accompanies the submittal.

2. “Or Equal”

1. Where the phrase “or equal” occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the Engineer. See “GENERAL CONDITIONS” Section 8, “SUBSTITUTIONS”.

3. Availability of Specified Items

1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified item or items will not be available, notify the Engineer prior to receipt of bids.
3. Cost of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Owner.

4. Reimbursement of Engineer’s Costs

1. In the event substitutions are proposed to the Engineer after the Contract has been awarded, the Engineer will record all time used by him and by his consultants in evaluation of each such proposed substitution.
2. Whether or not the Engineer approves a proposed substitution, the Contractor shall promptly, upon receipt of the Engineer’s billing, reimburse the Engineer at the rate of 2.9 times the direct cost to the Engineer and his consultants for all the time spent by them in evaluation of the proposed substitution.

2.06 OPERATION AND MAINTENANCE MANUALS:

1. General

The Contractor shall furnish operation and maintenance manuals for all mechanical and electrical equipment furnished under this Contract. The manuals shall be bound in first quality, heavy 8 ½” x 11”, three-ring looseleaf notebooks. Data shall be in the form of printed originals. Each equipment section shall be tabbed and labeled.

At a minimum, the manuals shall contain the following:

1. A neatly typewritten index at the front of the manual, furnishing immediate information as to location of all sections of each piece of equipment;
2. The front page of each section shall consist of a summary which contains the following information: name of firm, name and address of manufacturer, name plate information, name and address and telephone number of nearest representative, summary of maintenance requirements and spare parts list;

3. Complete instructions regarding operation and maintenance of all equipment involved;
  4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts;
  5. A copy of all guarantees and warranties issued;
  6. A copy of the Shop Drawings will all data concerning all changes made during construction.
2. Extraneous Data

Where the contents of Manuals include manufacturer's catalog pages, the exact item(s) used in this installation shall be clearly indicated and all manufacturer's data which is extraneous clearly deleted.

3. Number of Copies Required

Five (5) copies of manuals are required.

4. Schedule

Submit prior to 50% of project completion.

3.00 EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS:

1. General

Each submittal shall be accompanied with a letter of transmittal showing the date of transmittal, Specifications Section or Drawing number to which the submittal pertains and brief description of the material submitted.

2. Re-submittals

When material is re-submitted for any reason, it shall be submitted under a new letter of transmittal and referenced to the previous submittal.

3.02 COORDINATION OF SUBMITTALS:

1. General

Prior to submittal for review by the Engineer, all data shall be fully coordinated, including the following:

1. All field dimensions and conditions;

2. All trades and public agencies involved, including necessary approvals;
3. All deviations from the approved plans and/or specifications.

2. Grouping of Submittals

1. All submittals shall be grouped with associated items, unless otherwise specifically permitted by the Engineer.
2. The Engineer may reject parts of submittals as not complying with the provisions of the Contract Documents.

3.03 TIMING OF SUBMITTALS:

1. General

1. All submittals shall be made far enough in advance of installation to provide all required time for reviews, securing necessary approvals, possible revisions, and re-submittals, and placing orders and securing delivery.
2. In scheduling, the Contractor shall allow at least ten (10) full working days for the Engineer's review following his receipt of the submittal.

2. Delays

Cost of delays occasioned by tardiness of submittals on the part of the Contractor will not be borne by the Owner.

3.04 PROGRESS SCHEDULE:

A schedule of the proposed work and progress chart, showing the estimate time and dates for accomplishing the items of work within the time agreed upon for completion, shall be submitted to the Engineer at least four (4) working days prior to the Preconstruction Conference. Furnish no less than four (4) copies.

On a monthly basis, or as otherwise requested by the Engineer, Contractor shall submit an updated Construction Schedule which reflects actual progress. If, the Contractor's work is not in conformance with the Construction Schedule, Contractor shall take such actions as are necessary to bring the actual completion dates of its work activities into conformance with the Construction Schedule, and Contract Time.

Contractor shall notify the Engineer, either verbal or written, within 48 hours of any actual or anticipated event which is delaying or could delay any critical path activity of the Work. Contractor shall, within 7 days, provide written documentation that indicates the expected duration of the delay, the anticipated effect of the delay on the Construction Schedule and the action being or to be taken to correct the problem. Provisions of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

Acceptance of the Construction Schedule does not constitute acceptance of Contractor's construction means, methods or sequencing.

**3.05 RECORD DRAWINGS:**

The Contractor will be furnished with one (1) set of drawings designated as "RECORD DRAWINGS". During the progress of the work the Contractor shall maintain an accurate record of all changes to the "RECORD DRAWINGS". Such changes shall be entered on the drawings with "red" ink only. The drawings shall be submitted to the Engineer prior to project closeout and final payment approval.

**END OF SECTION**

1.00 GENERAL

1.01 DESCRIPTION:

The work specified in this Section includes trench excavation for pipe and appurtenances, bedding, trench backfill, compaction, finish grading and clean-up. Unless specified elsewhere, the work of this Section also includes clearing, grubbing, removal of all materials of whatever nature in the excavation limits, disposal of all waste materials, repairs and restorations, and maintenance of temporary surfaces as required.

Special provisions, requirements and/or revisions to this Specification and/or Bid Item(s) may be included in Section 01010 (green pages) and/or on the Drawings or Details.

1.02 QUALITY ASSURANCE:

1. Soils and Backfill

Moisture density standard ASTM D1557 method unless otherwise specifically approved.

2. In-Place Density Determination

Sandcone method ASTM D1556 or nuclear method ASTM D2922.

3. Classification of Soils

ASTM D2487

1.03 SUBMITTALS:

All materials shall be approved by the Engineer prior to the start of work. The Contractor shall notify the Engineer in advance of his intention to import material and of the borrow area selected. If feasible, the Engineer will inspect the material and source for approval, or he shall require the Contractor to submit representative sample of proposed material for review. If the Contractor chooses to manufacture and/or process in any way materials to be used, whether the material is to be imported, borrowed on-site, or obtained directly from the excavation, such material and process shall be approved by the Engineer prior to its use. All materials, whether native or imported, shall be subject to continued review by the Engineer for approval or rejection as the work progresses.

Unless specified otherwise elsewhere, prior to beginning of any excavation work, the Contractor shall provide the Engineer with an opportunity to obtain representative samples of all backfill materials, including representative native materials, to be used for determination of Proctor moisture-density curves. Unless specified otherwise, the cost of such determinations shall be the responsibility of the Owner. It is the Contractor's responsibility to provide such samples or

opportunity for the Engineer to obtain such samples adequately in advance of the work.

**2.00 PRODUCTS**

**2.01 FOUNDATION STABILIZATION MATERIAL:**

Unless other or additional requirements are required by the Drawings, foundation stabilization material, where required to replace soft or unsuitable trench bottoms, shall be well graded 2-1/2 inch minus granular material essentially free of dirt, silt, clay, and organic or deleterious matter.

**2.02 PIPE BEDDING MATERIAL:**

**1. Ductile Iron & Steel Pipe (All Sizes), PVC Pipe 4" Diameter and Larger**

Unless other or additional bedding material requirements are required by the Drawings, pipe bedding material to be installed and compacted under, around and above all pipe as specified in this Section shall be clean, well-graded sand or sand/gravel mixture with a maximum particle size of 3/4 inch, entirely free of clay, silt, organic or deleterious matter and frozen material. Minimum material weight shall be 110 pounds per cubic foot at 95% relative compaction. Bedding shall conform to the following graduation requirements:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1" square         | 100                    |
| 1/4" square       | 25-80                  |
| U.S. No. 200      | 0-7                    |

**2. Copper Water Service Pipe, PVC Pipe Less Than 4" Diameter**

All requirements of 2.02 A. (above) apply, except that bedding material shall be clean sand, free of gravel, with no more than 5% passing the No. 200 Sieve (by weight).

**2.03 TRENCH BACKFILL MATERIAL:**

Unless other or additional trench backfill material requirements are indicated on the Drawings, trench backfill material shall be sand, gravel, crushed rock, or native soil material free of humus, organic, frozen or deleterious material and debris. It shall contain no rocks larger than 12" in largest dimension, with no more than 25% of the material being such rock. It shall also be free of any consolidated, saturated or deleterious matter than may damage the pipe or structures or present a compaction problem. There shall be no rocks larger than 12" in largest dimension

within 2 ft. of the pipe. If the Engineer determines that the native excavated material is unsuitable for trench backfill, the Contractor shall backfill with approved native material from another work area, or if not available, with imported material.

### 3.00 EXECUTION

#### 3.01 PREPARATION OF EXCAVATION AREA:

Where clearing or partial clearing of the pipeline alignment and/or work area is required, such clearing shall be completed prior to starting trench excavation. Unless other or additional clearing, grubbing, and/or existing surfaces removal requirements are specified elsewhere in the Specifications or on the Drawings, pavements, trees, brush, grass and other materials in the pipeline alignment which are unsuitable for trench backfill shall be stripped and disposed of off-site in conformance with all applicable ordinances and regulations. In no case shall trench excavation material cover brush or trees.

All bituminous and concrete pavements in the trench excavation area shall be neatly cut in an approved manner prior to trench excavation. Such pavements, including roads, walks, parking areas, curbs, and other paved surfaces, shall be cut on each side at least 12" wider than the width of the top of the trench. In no case shall existing pavements be removed in such a manner as to damage the remaining pavement or lift it off its base material. Pavement materials so cut and removed shall be disposed of off-site in conformance with all applicable ordinances and regulations. Additional or other pavement removal requirements may be indicated on the Drawings or elsewhere in the Specifications.

Unless a separate payment item or items are provided in the Specifications or on the Drawings, all costs of such stripping and disposal of waste material shall be considered incidental to the trench excavation bid items provided herein and no additional payment will be made therefor.

#### 3.02 OBSTRUCTIONS:

Objects which are encountered during trench excavation operations, such as tree roots, stumps, abandoned structures or portions of structures, abandoned piping, logs, debris, paving, railroad ties, or any and all other obstructions shall be removed and disposed of off-site in conformance with all applicable ordinances and regulations. The Engineer, if requested, may make changes in the pipeline alignment to minimize interference caused by such obstructions when encountered.

Unless a separate payment item or items are provided in the Drawings or Specifications, the cost of removal and disposal of such obstructions, as well as the cost of delays that may be caused by same, shall be considered incidental to the trench excavation bid items provided herein and no additional payment will be made.

3.03 CLASSIFICATION OF TRENCH EXCAVATION:

1. General

Trench excavation may be classified or unclassified. If a trench rock excavation or drilling and blasting bid item is included in this Section, then the following definition of trench rock excavation shall apply to that bid item. If no trench rock excavation bid item is provided, and if no other excavation classifications and bid items are provided, then all trench excavation of any nature, including excavation and disposal of rock as defined below, shall be considered included in the trench excavation bid item and no additional payment will be made.

All trenches shall be sloped and/or braced and sheeted, and trench excavation material stored and retained, in accordance with the most stringent of the applicable laws and regulations, in accordance with good safety practice, and as necessary to protect persons, adjacent or affected property, and the work.

2. Trench Excavation

Trench excavation shall be such excavation where the excavated material is piled essentially beside the trench as it is removed, and backfilled from this position. Also included in this definition is any and all material of whatever nature that must be transported to another site for disposal, or for temporary stockpiling prior to backfill due to confined work area, or transported to another trench backfill location for any reason. Unless specifically provided for in other bid item(s), all costs of such handling, transport, stockpiling and/or disposal shall be considered incidental to trench excavation and no additional payment will be made.

3. Rock Excavation

Rock trench excavation shall be excavation of boulders (exceeding 1.0 cubic yard in volume), ledge rock, or other solid rock material requiring pneumatic equipment (“hoe ramming”) or systematic drilling and blasting for its removal. Hard pan, hard clay, glacial till, and soft, weathered or other extensively fissured rock will not be considered rock trench excavation and is not defined as rock requiring drilling and blasting or hoe ramming. No drilling and blasting or hoe ramming of rock shall be done without prior approval by the Engineer that such operations are required. All boulders, ledge rock, and other solid rock shall be removed to provide at least 6" clearance below the pipe. Excess excavated rock material and rock excavation that is not suitable for trench backfill shall be removed and disposed of off-site by the Contractor. Materials removed shall be replaced with materials from adjacent trenches or with imported bedding or imported trench backfill as designated by the Engineer.

If rock excavation is to be accomplished through drilling and blasting, the blasting shall be done in such a manner to prevent damage to structures, utilities and other improvements, but in no case shall ground vibration exceed 2 inches/second peak particle velocity for 40 hertz and greater frequency of vibration. The Contractor shall submit a blasting program 7 days prior to any drilling. Drilling and blasting shall not commence until the Engineer has reviewed the submitted blasting program. Review of the blast plan by the Engineer shall in no way relieve the Contractor of the sole responsibility for the accuracy, adequacy or safety of the plan when implemented in the field, nor for any damage to structures, utilities or improvements that may result. The Contractor shall be solely responsible for the planning and execution of any and all drilling and blasting, and for its adequacy, safety and compliance with all applicable laws, ordinances and regulations. All drilling and blasting shall be done in strict conformance to federal, state and local requirements pertaining to this work, and with materials and methods that assure the protection of persons and property. Any damage or injury to persons or property, including existing buried utilities or structures, resulting from rock excavation operations shall be the sole responsibility of the Contractor.

Whenever blasting is required, the Contractor shall conduct a pre-blast structure survey on all structures above and below ground within the affected area of his work which may be subject to blasting damage. The survey shall be conducted prior to the start of any blasting operation and shall include an area of at least 250 feet ahead, behind, and to the sides of any area to be blasted. The Contractor shall complete the pre-blast survey of all structures that could be affected by a particular blast a minimum of two (2) days prior to said discharge, and deliver a copy of the survey to the Engineer not later than one (1) day prior to the blasting operation. The Contractor also shall make every effort to keep the owners of structures that could be affected by a blast informed as to the timing of the discharges. However, it is the Contractor's responsibility to conduct the survey in a manner to ensure all structures having reasonable possibility of sustaining blast damage are included in the survey, irrespective of their proximity to blast site. The pre-blast structure survey shall be recorded on appropriate forms and may be supplemented by photographs, video tapes, tape recordings or other suitable methods of documentation. One copy of the form shall also be delivered to the Engineer no later than one (1) week after the survey is completed, unless required sooner as provided for above.

All blasts shall be recorded with one or more seismographs capable of recording the three components of motion. The Engineer shall be notified a minimum of two (2) hours prior to blast detonation. Seismographs shall be located proximate to the excavation site and adjacent to the closest sides of the closest structures (or wells) to the blast. The Contractor shall record the location, time and ground vibration for each blast on a suitable documentation form and deliver a copy of the form to the Engineer no later than one (1) week after the blast is detonated.

#### **3.04 TRENCH EXCAVATION SAFETY SYSTEM:**

The Contractor shall provide a Trench Excavation Safety System in compliance with all federal and state regulations. The safety system shall meet the provisions of the Washington Industrial Safety and Health Act, as set forth in the latest Revised Code of Washington (RCW), as required for trench

excavations.

Neither the Engineer nor the Owner will inspect, review, approve, or have any liability for the adequacy of the Contractor's Trench Excavation Safety System.

Payment for the Trench Excavation Safety System will be made under a separate Bid Item. Payment for the Trench Excavation Safety System shall not be construed as acceptance or approval of the Contractor's Trench Excavation Safety System.

This bid item shall reflect the actual cost of providing the Trench Excavation Safety System. Bids received with a lower than actual cost may be judged to be nonresponsive and therefore rejected.

### 3.05 LIMITS OF EXCAVATION:

The length of trench excavated in advance of pipe laying shall be kept to a minimum, and in no case shall exceed 150 feet unless specifically approved by the Engineer.

The trench shall be of sufficient width to permit proper assembly of the pipe and installation and compaction of bedding and backfill materials. Trench width at the surface of the ground shall be kept to the minimum necessary to install the pipe, but in full conformance with federal, state and local safety requirements.

### 3.06 EXCAVATION LINE AND GRADE:

Trench excavation shall be made to the lines and grades indicated by the Drawings and Specifications and/or as established by the Engineer in the field, with proper allowance for all bedding or foundation replacement requirements. Unless specified otherwise on the Drawings, excavation shall allow for the installation of at least 4" of bedding material below the pipe where no rock exists in the trench bottom, and 6" below the pipe in rock. If the trench is excavated below the required grade at the option of or error by the Contractor, the trench bottom shall be brought back to grade with compacted bedding or foundation replacement material compacted in lifts to 95% density as herein specified, at no additional cost to the Owner.

Trench excavation planning and operation shall result in the installation of all pipe, appurtenances and structures in full conformance with the installation and testing requirements specified for the particular type of pipe, structure and/or appurtenances for which the excavation is intended. In the case of water pipe, the trench shall provide for straight grades between vertical bends shown on the Drawings, with no localized high points. A depth deeper than the specified minimum excavation depth may be required to avoid such localized high points. In the case of sewer pipes, the specified finished pipe grade and alignment will require exacting and careful trench excavation and workmanship to provide a firm trench bottom and pipe foundation. In all cases, a firm and unyielding trench bottom shall be provided for pipe, structure and appurtenance foundation.

### 3.07 UNSUITABLE FOUNDATION CONDITIONS:

Wherever trench excavation results in a trench bottom that contains voids, is saturated, soft, or in any other way in the opinion of the Engineer is unsuitable for foundation, such trench bottom material shall be removed to a depth approved by the Engineer, and disposed of by the Contractor. Approved Foundation Stabilization Material shall be placed and compacted by the Contractor in lifts, to a relative density of at least 95% as herein specified. Payment for such foundation excavation, disposal and replacement shall be as provided herein.

### 3.08 CONTROL OF WATER:

During excavation, installation of pipe, structures and appurtenances, backfill operations, and the placing and curing of concrete, all excavation areas shall be kept free of water except as otherwise specified or designated on the Drawings. The Contractor shall at all times control surface and subsurface drainage so as to prevent its entering the work. In no case shall the pipe or appurtenances being installed be used as a conduit to remove or transport surface or subsurface drainage.

The Contractor shall furnish, install and operate in such locations and when necessary, such equipment and materials that are required to keep excavations free from water, and shall dispose of water without causing nuisance, damage, or injury to persons or property. He shall at all times have on hand sufficient and reliable pumping equipment and pump drives in good working order, and operational in spite of all ordinary emergencies, including power outages. He shall also have available at all times adequate and competent manpower to operate and maintain such equipment as necessary.

The control of groundwater shall also prevent the softening of trench and excavation bottoms, and dewatering materials, equipment and methods shall prevent the removal of natural soils. Dewatering operations shall draw down subsurface water to a level at least 1 foot below the bottom of the excavation and result in the maintenance of the undisturbed state of foundation soils, and allow proper pipe, structure, and appurtenance installation, as well as the installation and compaction of all backfill materials to the specified density. Dewatering installation and operations shall not reduce the water level to the extent that it may damage or endanger other structures or improvements in the vicinity.

Open and cased sumps shall not be used as primary dewatering methods for excavations deeper than 3 feet below the static water level.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the foundation soils prevent disturbance of compacted backfill materials, and prevent flotation or movement of pipe, structures or appurtenances.

Unless a separate Bid Item is provided, all control of water and dewatering design, labor, materials and equipment shall be considered incidental to trench excavation and no additional payment will be made therefor.

**3.09 BEDDING MATERIAL INSTALLATION AND COMPACTION:**

The specified pipe bedding material shall be placed and compacted for all pipe, structures and appurtenances. All bedding material shall be compacted to 95% relative density, as determined by ASTM D-1557, unless otherwise indicated on the Drawings.

In addition to the requirements specified herein, all pipe backfill and compaction methods and equipment shall also conform to the pipe manufacturer's written installation instructions or manuals, which the Contractor shall have on the site. Water settling of the trench to attempt compaction shall not be allowed unless specifically approved by the Engineer or indicated on the Drawings.

Pipe bedding material shall be placed in the trench in such a manner as to protect the pipe and appurtenances from movement or damage. In general, material shall be placed into the trench by pushing it from the end of the trench at an angle along and over the pipe so that the material is placed in the form of a rolling slope rather than by side filling. Free falling material shall not be allowed to fall directly on the pipe.

A minimum 4" of bedding material shall be installed under the pipe in normal trench bottoms, and a minimum of 6" under pipe where trench bottoms contain rock. The trench bottom and bedding shall be hand graded and compacted to provide uniform and continuous support for the full length of the pipe. Depressions in the bedding shall be hand-formed to allow proper assembly of the pipe. Care should be taken to make the depression no larger than necessary, and to hand fill and compact bedding material into and around the pipe bell to provide adequate support of the pipe and pipe joint.

Bedding material shall be placed in maximum 8" lifts to the spring line of the pipe, taking care to adequately place and compact the material for the full width of the trench to the specified density, under and around the pipe on both sides evenly, and for its full length so as to provide adequate lateral pipe support and strength without altering its proper grade and alignment. T-bars of proper weight and shape shall be used for hand compacting bedding material under and around the pipe, taking necessary precautions to prevent movement of the pipe during the operation.

After placement and compaction of bedding material to the pipe spring line, additional bedding material shall be placed and compacted in sufficient lifts to obtain the specified compaction. Unless specified otherwise on the Drawings or in Section 01010, bedding material shall be placed and compacted to a depth of at least 12" above the pipe, and for the full width of the trench.

Bedding and/or side support material that is disturbed by removal or moving the trench excavation safety system shall be recomacted to specified density before proceeding with backfilling.

**3.10 TRENCH BACKFILL AND COMPACTION:**

Unless indicated otherwise on the Drawings, all trench backfill in roadway and other surfaced areas

shall be compacted to at least 92% of maximum density as determined by AASHTO T-180, except the top 2' of backfill under paved areas shall be compacted to 95%. Trench backfill in other areas shall be compacted to at least 90% of maximum density as so determined. All trench backfill material shall be as specified herein.

The Contractor shall not side fill the trench with backfill material until at least 2 feet of bedding and backfill material has been placed and compacted. Trench backfill material as specified shall be placed and compacted in lifts to the specified density. The Contractor shall select and use compaction equipment such that the pipe and appurtenances are not moved or damaged in any way. In general, heavy self-propelled equipment shall not be operated in the trench until at least 3 feet of backfill has been placed and compacted.

### 3.11 BACKFILL SETTLEMENT:

Settling of any trench within 1 year after final acceptance of the work shall be considered incontrovertible evidence of inadequate compaction. Upon notification of such settlement, the Contractor shall promptly perform such remedial work as may be required to correct the deficiency to the satisfaction of the Owner, including replacement of surfacing materials, at no additional cost to the Owner. If such remedial work is not promptly performed, the Owner may exercise its rights as holder of the required performance bond and make such repairs as it deems fit, recovering the resulting expenses from the bond surety.

### 3.12 RESTORATION, FINISHING AND CLEAN-UP:

The Contractor shall restore, replace or repair such surfaces, structures and improvements as may have been disturbed, removed or damaged as a result of his operations. All such items shall be returned to a condition equal to that before the work began and to the satisfaction of the Engineer. All surplus and waste materials shall be removed and surfaces cleaned. Of particular importance are existing drainage facilities and ditches, which shall be carefully and completely restored to their intended function as soon as possible after disturbance, even if all other work in the area is still under way. Partial or final payments may be withheld if required restorations, repairs, finishing and clean-up are not satisfactorily completed.

### 3.13 TRENCH BACKFILL SURFACE MAINTENANCE:

Unless required otherwise on the Drawings or specified elsewhere in the Specifications, temporary trench backfill surface restoration and maintenance shall be as required in this paragraph and performed at no additional cost to the Owner.

The Contractor shall diligently and continuously maintain temporary trench surfaces after backfill to provide smooth and firm traffic surfaces where required until permanent surfacing is placed. This maintenance may include placement of crushed rock, oil, and/or temporary pavement materials to keep traffic areas smooth. Dust control shall also be performed as required.

Temporary surfaces shall be maintained by the Contractor until the following operations and items as required have been completed and approved by the Engineer:

1. Installation of service connections, lines and appurtenances
2. Installation of valve boxes, cleanouts, manholes and other surface features
3. Pipeline, manhole and other testing
4. Clean-up and restoration of all other physical features
5. Restoration and repair of disturbed utilities as required

No permanent pavement or other surface replacement or repair shall be undertaken until the above items have been satisfactorily completed and approved by the Engineer.

END OF SECTION

**TOWN OF MILLWOOD  
WATER SYSTEM  
STANDARD SPECIFICATIONS**

**FINISH GRADING  
Section 02245 - Page 1**

1.00 GENERAL

1.01 DESCRIPTION:

1. Work Included

The Contractor shall furnish all labor, materials, and equipment necessary to finish grade all areas disturbed in the construction of this project.

2.00 PRODUCTS

During finish grading operations the Contractor shall utilize native and excess excavated materials, substantially free from rock (in excess of three (3) inches in diameter), wood, bark, grass, or other organic matter.

3.00 EXECUTION

Finish grading shall be carried out to the elevations and grades as shown on the plans. If such information is not provided on the plans, the Contractor shall grade the project areas to uniformly blend with the contours and grades existing prior to construction.

Finish grading shall include the removal from the project sites of all exposed rocks greater than 3 inches in diameter and disposing of them in an area procured by the Contractor.

END OF SECTION



1.00 GENERAL

1.01 DESCRIPTION OF WORK INCLUDED:

The work described in this Section includes furnishing and installing all water mains, fittings, valves, services, service pipe, thrust blocks and any and all other labor, materials and equipment necessary for the proper completion of the system as shown on the plans and described in the specifications. Also included in this Section is all required system disinfection and testing.

1.02 MATERIAL STORAGE AND HANDLING:

The Contractor shall make his own arrangements for adequate area and access thereto for proper and safe storing and protection of all pipe materials and appurtenances prior to installation. All pipe shall be stored on a flat and reasonably level surface, with the full pipe length supported to prevent distortion of the pipe during storage. Pipe shall not be stacked in piles higher than 5 feet. Pipe and other materials shall be unloaded, handled, transported and stored using all possible means to protect the materials, and in full conformance with the manufacturer's written instructions, which the Contractor shall have on site. During cold weather, extra care shall be taken in handling all materials.

Submittals shall conform to Section 01300.

2.00 PRODUCTS

2.01 WATER MAIN PIPE:

Ductile iron pipe shall be cement mortar lined, with push on, mechanical, restrained or non-restrained joints as shown on the Drawings, in accordance with AWWA C104, C111, and C151 of the size shown on the Drawings and/or in the Bid Items included in this Section. See below for restrained joint specifications. Pipe shall be of the thickness specified in AWWA C-151/A21.51 for the minimum pressure class for each pipe size.. All flanged pipe shall be of the thickness specified in AWWA C-115/A21.15.

PVC pipe shall be AWWA C-900 Class 150 unless specified otherwise.

The type(s) of pipe to be used in this project shall be as specified in Section 01010 or on the Drawings. Unless indicated otherwise, only one pipe material shall be used on the project.

**2.02 PIPE FITTINGS AND COUPLINGS:**

Water main pipe fittings shall be cement mortar lined cast or ductile iron of pressure rating in conformance with the specified pipe, and in conformance with AWWA C104, C110, C111 and C153. Fitting configuration, size and end type shall be as shown on the Drawings and as required for the pipe, valves, details and appurtenances as specified herein. See below for restrained joint specifications.

All couplings shall be ductile iron of the type and size required by the connecting pipe, material or appurtenances, and of pressure rating at least equivalent to the other materials. The location, size and type of all couplings shall be as shown on the Drawings, or as approved by the Engineer. Ductile iron for center rings, bodies and end rings shall meet ASTM A536. Gaskets shall be virgin SBR compounded for water service and meeting ASTM D2000 3BA 715. Bolts and nuts shall be high strength, low alloy steel meeting AWWA C111. Straight couplings shall be Romac 501 or approved equal. Flanged coupling adapter shall be Romac FCA 501 or approved equal.

Gaskets for flanged pipe and fittings shall be 1/8 inch thick, full faced, red rubber, and meet the material requirements of ANSI A21.11.

**2.03 FIELD FLANGES:**

Field flanges shall meet the design class of the existing flange it is to mate with. Body material shall be ductile iron meeting or exceeding ASTM A536.71. Set screws shall be corrosion resistant AISI 4140 steel alloy or ductile iron. Gasket shall be virgin SBR compounded for water or sewer service and meeting ASTM D2000 3BA 715. Flanges shall allow a minimum joint deflection of 2° for nominal pipe sizes up through 10", shall be UL tested and approved, and shall be Romac or approved equal.

All field flanges which are buried shall be coated with bitumastic after installation.

**2.04 RESTRAINED JOINTS FOR PIPE, VALVES AND FITTINGS FOR DI PIPE:**

The type of thrust restraint used shall be as indicated in Section 01010 and/or on the Drawings. If not indicated, either restrained joint pipe, valves and fittings or thrust blocks, at the contractor's option, shall be used.

All restraining type joints, glands, gaskets, couplings, clamps or other devices used with ductile iron (DI) pipe shall:

1. be specifically designed, tested, manufactured, FM approved and UL listed for the specific type, material, size and class of pipe upon which it is proposed for use, and for buried service;
2. have bodies (if applicable) made entirely of ductile iron;

3. shall have a minimum tested safety factor of 2.0 times rated pressure of both the device and the pipe for all tests, when tested on the specific pipe type, material, size and class upon which it is proposed for use.

**2.05 RESTRAINED JOINTS FOR PIPE, VALVES AND FITTINGS (FOR PVC PIPE):**

The type of thrust restraint used shall be as indicated in Section 01010 and/or on the Drawings. If not indicated, either restrained joint pipe, valves and fittings or thrust blocks, at the contractor's option, shall be used.

All restraining devices other than thrust blocks used on PVC water main pipe shall meet the following requirements:

1. a. For mechanical joint restraining devices: be specifically designed, tested, manufactured, FM approved, UL listed and successfully UNI-B-13 tested for the specific type, material, size and class of pipe upon which it is proposed for use, and for buried service;
- b. For push-on joint restraining devices: be specifically designed, tested, manufactured, FM approved or UL listed or successfully UNI-B-13 tested for the specific type, material, size and class of pipe upon which it is proposed for use, and for buried service;
2. have bodies and tie bolts (if applicable) made entirely of ductile iron;
3. shall have a minimum tested safety factor of 2.0 times rated pressure of both the device and the pipe for all tests, when tested on the specific pipe type, material, size and class upon which it is proposed for use;
4. shall be as manufactured by EBAA Iron, Inc. or approved equal.

**2.06 VALVES AND VALVE BOXES:**

All valves larger than 2" shall be butterfly valves or resilient seat gate valves in accordance with AWWA C504 and C509 respectively, as indicated on the Drawings, with 2" operating nut (for buried service) or handwheel opening counter clockwise. Butterfly valves shall be Class 150B, Pratt, M & H Dresser or approved equal. Resilient seat gate valves shall be American Darling, M & H Dresser, or approved equal.

Except as shown on the Drawings or Detail Drawings, valve boxes for buried-service valves shall be cast iron two-piece slide-type adjustable boxes with cast iron drop type lids marked "water".

Inside diameter of the bottom portion of the box shall be at least 8"; minimum inside diameter of the upper portion of the box shall be 5-1/4". Only identical cast iron valve box extensions shall be utilized. Valve box complete extension shall range from 48" to 72".

**2.07 FIRE HYDRANT:**

Fire hydrants shall be Mueller Super Centurion or approved equal, opening counter clockwise. Hydrant extensions, if needed, shall be of the same manufacturer as the fire hydrant.

**2.08 WATER SERVICE INSTALLATION/REPAIR MATERIALS:**

All materials shall conform to AWWA C800. Except at PVC service pipe, all materials shall provide electrical conductivity.

**1. Service Pipe**

Service pipe 1½" in diameter or less shall be type K soft drawn copper tubing, conforming to the applicable AWWA standard for copper water tube. Larger diameter service pipe shall be as shown or specified on the Plans or detail Drawings.

**2. Service Saddles**

Service saddles for ductile iron and steel pipe shall be ductile or malleable iron double strap saddles, Romac Style 202 or approved equal. Service saddles for PVC pipe shall be ductile iron with minimum 2" wide stainless steel strap.

**3. Corporation Stops**

Corporation stops shall be high quality bronze water works fittings conforming to AWWA C800, with male iron pipe thread inlets and outlets suitable for the connecting service pipe material, Ford, Mueller or approved equal.

**4. Curb Stops and Curb Boxes**

Curb stops, if required shall be high quality bronze water works fittings conforming to the applicable AWWA standard and with the end types shown on the plans or details. Standard adjustable two-piece cast iron curb boxes shall be properly installed on all curb stops unless shown otherwise on the Drawings. All curb stops and connecting pipe shall be installed using end types that will restrain the curb stop and prevent it from coming off the service pipe under pressure if the service pipe on the customer side of the stop is not connected. Electrical conductivity shall be adequate for high amperage electrical pipe thawing.

**5. Pack Joints**

Pack joint couplings shall provide a water-tight seal on all types of service pipe, including existing service pipe materials, and shall provide both positive end restraint and positive and adequate electrical conductivity for high amperage electrical pipe thawing. They shall be Ford "Pack Joint Couplings", or Mueller 110 compression couplings, with the end types as required for the particular pipe diameter and material encountered.

**2.09 UTILITY MARKING TAPE:**

1. Detectable

Detectable marking tape shall be 5.0 mil overall thickness with a 50 gauge aluminum foil core covered by polyethylene. Tape shall be color code impregnated with permanent message printing under a mylar layer. Color and message shall be appropriate for specific utility. Tape shall be THORTEC, or equal.

2. Non-Detectable

Non-detectable marking tape shall be 4.0 mil overall thickness polyethylene, color code impregnated, with permanent message printing. Color and message shall be appropriate for specific utility. Tape shall be SHIELDTEC, or equal.

**2.10 PIPE LOCATING WIRE AND CLAMPS:**

Pipe locating wire shall be #10 insulated THHN solid copper wire. Clamps for attaching the locating wire to water services shall be UL listed ground clamps commonly used for grounding wire to copper or galvanized steel water service pipes. Clamps shall be of the appropriate size as required for the wire and service pipe in the field.

**2.11 RIGID INSULATION:**

Insulation shall be closed cell, extruded polystyrene foam. Minimum compressive strength of 25 psi (ASTM D1621-73) and maximum water absorption of 0.3% (ASTM C272-73). Insulation to be installed as shown on the drawings where minimum cover cannot be achieved.

**2.12 THRUST BLOCKS:**

All concrete for thrust blocks shall be made from high-early strength concrete with 3" slump, using 6 ½ sack mix (611 pounds per cubic yard). Minimum 28-day compressive strength shall be 3,000 psi. All steel used to restrain fittings or valves shall be hot dip galvanized after fabrication and bending, and coated with bitumastic after installation.

**2.13 OTHER MATERIALS:**

All other materials not specifically described but required for proper completion of the work shall be new, of the highest quality, in conformance with the applicable AWWA standard, and subject to the approval of the Engineer.

**3.00 EXECUTION**

**3.01 TRENCHING, BEDDING, AND BACKFILLING:**

All trenching, bedding, backfilling, and compaction for water pipelines and appurtenances shall be done in strict conformance to the requirements of Section 02221 of these Specifications.

**3.02 INSPECTION OF MATERIALS:**

All pipe and appurtenances shall be inspected before installation for cracks, defects and workability. All dirt, scale, and burrs shall be removed as required for proper installation.

**3.03 PIPELINE INSTALLATION:**

**1. General**

1. All pipe and appurtenances shall be installed in accordance with the manufacturer's published recommendations and the appropriate AWWA Standard, except as modified by these specifications. The Contractor's on-site representative shall have at all times a copy of the manufacturer's installation booklet. A copy of the appropriate installation booklet shall also be provided by the Contractor for the Engineer.
2. All pipe shall be laid on the lines and grades shown on the Drawings. If no pipe grades are shown, all pipe shall be laid on a straight grade without localized high points. In no case shall any pipe have an earth cover less than 5.0 feet, unless shown otherwise on the Drawings, or as may be approved in the field by the Engineer.
3. Maximum allowable pipe or joint deflection shall be 80% of manufacturer's recommended maximum.
4. Unless specifically approved otherwise by the Engineer, pipe laid on slopes steeper than 15% shall be laid uphill, with the bells facing uphill.
5. All water pipelines and appurtenances, including new services, shall be pressure tested and disinfected in accordance with these Specifications.

**2. Fittings**

All fittings shall be installed on a compacted foundation of bedding material and restrained with restrained joints or thrust blocks as shown on the Drawings and Detail Drawings. A torque wrench shall be used for final tightening of all mechanical joint and flanged end fittings.

**3. Restrained Joint Pipe and Fittings**

1. The type of thrust restraint used shall be as indicated in Section 01010 and/or on the Drawings. If not indicated, either restrained joint pipe, valves and fittings or thrust blocks, at the contractor's option, shall be used.
2. Restraining type joints, glands, gaskets, couplings, clamps or other devices shall be installed in strict conformance with the manufacturer's written instructions for the specific pipe and fitting on which it is being installed. Such written instructions shall be in the possession of the installer(s) at all times.

3. All restraining type joints, glands, gaskets, couplings, clamps or other devices shall remain exposed for inspection after assembly prior to backfill whether or not a First Test (see Pipeline Testing) is conducted.
4. Pipe joint restraint shall be provided on all pipe connected to a restrained joint fitting or valve unless a thrust block is used. Unless specified otherwise on the Drawings, the minimum length of pipe with joint restraint shall be as shown on the following table, as adjusted for actual test pressure and pipe depth at time of testing. The length of pipe indicated in the table shall apply for each pipe connected to the valve or fitting; for example a 40' table value shall mean a minimum 40 feet of restrained joint pipe in each direction from the valve or fitting, at 100 psi test pressure.

**MINIMUM LENGTH RESTRAINED JOINT PIPE  
AT FITTINGS<sup>(1)</sup> AND VALVES  
PRESSURE 100 PSI<sup>(2)</sup>, MIN. COVER DEPTH 4.0'<sup>(3)</sup>**

| <u>Pipe Dia.</u> | <u>D.I. Pipe</u> | <u>PVC Pipe</u> |
|------------------|------------------|-----------------|
| 4", 6"           | 15'              | 20'             |
| 8", 10"          | 20'              | 25'             |
| 12"              | 25'              | 30'             |

- (1) **One-half of the lengths shown may be used for 22½° and 11¼° elbows. Use 125% of the table value for dead ends.**
- (2) **For other pressures multiply by ratio to 100 psi.**
- (3) **Assumes pipe bedding compacted to 90%.**

4. Valves

Install valves in vertical position on a compacted foundation; check workability before installation. Valves not bolted to a fitting flange shall be installed with thrust blocks and/or restrained joints as specified herein. Furnish and install a valve box for each buried valve.

5. Valve Boxes

Set valve boxes during backfilling to be plumb; cushion lower unit from valve body; set top elevation flush in roadways and 1" high in other areas.

Extra care shall be taken when installing the upper unit of the valve box to provide adequate foundation under the lip to avoid future settlement of box.

6. Thrust Blocks

Install concrete thrust blocks at all changes in direction and at all connections and branches from the main; size and place the thrust blocks in accordance with the Detail Drawings and/or as may be

shown on the Drawings. Protect concrete during curing period. For restrained joint pipe, valves and fittings, install thrust blocks only where shown on the Drawings, however, at the Contractor's option, temporary blocking for testing may be utilized.

7. Fire Hydrants (New, Reconnect or Replace)

Hydrants shall be installed in accordance with the Detail Drawings and/or as shown on the Drawings. Hydrants shall be installed in a plumb position, with the break flange just above the finished grade or finished curb grade. Pumper port shall face the street, unless directed otherwise by the Engineer.

Where re-connection of an existing hydrant from an existing main to a new main is required, the Contractor shall preserve and protect the existing hydrant. Hydrant pipe may or may not be replaced, as may be shown on the Drawings or as required by the Engineer in the field. Prior to installing the new main the Contractor shall expose the existing hydrant pipe to determine connection and grade requirement.

Where an existing hydrant is to be replaced by a new one as shown on the Drawings or as directed by the Engineer in the field, the Contractor shall remove the old hydrant full depth if the new hydrant is to be installed at the same position, or at least 6" below finished grade if the new hydrant is to be installed elsewhere. All pipe and hydrant components left below grade shall be abandoned as specified herein. All removed pipe and components shall be disposed of offsite, unless directed otherwise.

3.04 CONNECTIONS TO EXISTING PIPELINES:

At the locations shown on the Drawings, connections shall be made to existing pipelines. The Contractor, in advance of pipe trenching operations, shall expose the existing pipeline and determine the connection and grade requirements. Elbows and short lengths of pipe shall be used where necessary to connect to existing mains. Where approved by the Engineer, the new pipe alignment may be adjusted to make the connection. Connection details to existing mains are based on information available on size, type and location of existing pipe. The Contractor shall excavate and expose existing pipe where new mains are to be connected, prior to starting work in the area, to confirm location, depth, type and size of existing items and to confirm fittings and couplings required. The Contractor shall have the proper materials on hand prior to interrupting service and shall organize and perform his work to minimize interruptions. Care should be taken to prevent contamination of existing mains and new pipe and fittings. Disinfect prior to assembly.

3.05 BLOWOFF ASSEMBLIES:

Blowoff assemblies shall be constructed according to Detail Drawing. Location of assembly and distance from main shall be as shown on the Plans or as directed by the Engineer in the field.

3.06 AIR VACUUM RELIEF STATIONS:

Install manholes, piping, fittings and valve assemblies plumb and vertical according to the Detail Drawings, and in the locations shown on the Plans.

**3.07 UTILITY MARKING TAPE:**

Unless otherwise indicated on the Plans or in Section 01010, or unless pipe locating wire is installed, detectable utility marking tape shall be installed in all non-metallic pipe installations. Unless detectable utility marking tape is installed, non-detectable tape shall be installed in all pipe installations (whether metallic or not) where pipe is not installed in a street right-of-way. Tape shall be placed a minimum of 24" above the pipe.

**3.08 PIPE LOCATING WIRE AND CLAMPS:**

Pipe locating wire shall be installed where specifically indicated in Section 01010 and/or on the Drawings. Wire shall be installed directly above or next to the pipe within 3" of the pipe and in the pipe bedding, with care to prevent damage to the wire. Wire shall be attached to each service connection at the main with clamps as specified to provide continuity through service pipes for locating. Wire shall be brought up into all main line valve boxes to the ground surface, with 1' extra wire. Where mains intersect, or where more than one valve is installed, all wires shall be brought up into all valve boxes, using jumper wires and wire nuts as required. The contractor shall test and demonstrate the continuity of all locating wires after backfill and compaction.

**3.09 RIGID INSULATION:**

Rigid insulation shall be placed 12" over the water line whenever the minimum depth of cover cannot be achieved. The insulation shall be 2' wide and extend 5 additional feet along the length of pipe after minimum cover has been achieved. This shall include but not be limited to creek, culvert and ditch crossings.

**3.10 ABANDONMENT OF EXISTING PIPE:**

See General Requirements Section 01020.

**3.11 PIPELINE TESTING:**

**1. General**

All piping and appurtenances shall be tested as specified herein. All pipeline tests shall be conducted after installation of service saddles and corporation stops (if any), and other appurtenances that are directly connected to or a part of the pipeline. Service pipe shall be tested with the mains, or separately, at the Contractor's option. Also at the Contractor's option, the testing, disinfection, and flushing of any portion of pipeline may be combined into one operation.

The Contractor shall notify the Engineer 24 hours in advance of testing operations. All testing shall be done in the presence of the Engineer.

All testing equipment, fittings and gauges shall be provided by the Contractor and shall be approved as satisfactory by the Engineer prior to testing. The Engineer may at any time require a calibration

check of the test pressure gauge.

Before testing, at least 36 hours shall elapse after the last concrete thrust block has been cast with high-early-strength cement, and at least seven days shall elapse after the last concrete thrust block has been cast with standard cement, unless otherwise required by the Drawings or Specifications.

2. Pressure and Leakage Testing

1. General

All new piping and appurtenances shall be hydrostatically tested as follows. The following combined pressure and leakage test shall be conducted on each individual section of installed pipe between valves. Unless indicated otherwise on the Drawings or Section 01010, the First Test may be conducted or eliminated, at the Contractor's option.

1. First Test

An initial pressure and leakage test shall be conducted as soon as possible after sufficient backfill has been placed to prevent the movement of the pipe. Backfill shall be placed in such a manner that all couplings, fittings, valves and connections, including service connections, are completely exposed for visual inspection. The Contractor shall provide adequate lateral and vertical restraint to all pipe, valves and fittings during the first test.

2. Second Test

A final pressure and leakage test shall be conducted after all backfilling has been completed and before placement of permanent surfacing or structures.

3. Test Pressure

Test pressure for all piping shall be 200 psi, unless otherwise indicated on the Drawings.

2. Procedure

1. Test Duration

The total time for each combined pressure and leakage test for each section shall be a minimum of 2 hours.

2. Filling

The pipeline shall be filled with water for a minimum of 24 hours. Each section of the pipeline shall be filled slowly with water and all air expelled by means of taps at points of highest elevation.

3. Pressurization

The specified test pressure shall be applied to the pipe and shall be maintained for the specified time.

If the test pressure exceeds the capacity of the valves isolating the section of pipeline being tested, the Contractor shall pressurize adjacent sections with sufficient pressure to reduce the differential pressure on the valves to within their rated capacity.

3. Visible Leakage

During the first test, all pipe, couplings, fittings, valves and hydrants shall be examined by the Engineer and Contractor. All cracked or defective elements shall be replaced. Any observed leakage, regardless of the amount, shall be corrected. The test shall be repeated as necessary until all visible leakage has been corrected. The amount of any leakage that cannot be located and repaired shall be accurately measured by the Contractor.

4. Allowable Leakage

During the second test the amount of water pumped into the lines to maintain the test pressure shall be accurately measured by the Contractor.

The allowable leakage rate for the pipe tested shall be as specified in AWWA C600, or if not covered by AWWA, then as recommended in the pipe manufacturer's installation guide. If the Contractor elects to eliminate the First Test however, regardless of the length of pipe being tested, the allowable leakage shall not exceed that for 350 feet of pipe, unless indicated otherwise on the Drawings. If the test leakage rate in any pipe is greater than the allowable, or greater than the leakage measured during the first test, the leakage shall be located and repaired. The test shall be repeated until the leakage rate is less than the allowable.

5. Connections to Existing Piping

The joints that are necessary to connect a pipeline, fitting or valve to an existing pipeline shall be subjected to a visible leakage test (all joints exposed), conducted at system pressure for at least two (2) hours. All visible leakage shall be corrected by the Contractor. The test shall be repeated as necessary until all visible leakage has been corrected. It is the Contractor's responsibility to ensure that all fittings and pipe are adequately restrained while exposed during testing.

3.12 PIPELINE DISINFECTION:

1. General

It is the Contractor's responsibility to provide adequate disinfection and bacteriological test sampling of all water lines and appurtenances in accordance with the Department of Health requirements. Bacteriological test samples shall be taken at least once for every 1200 lineal feet of pipe or less according to local utility or regulatory standards. It is also the Contractor's responsibility to insure that neither contaminated water, nor water with strong chlorine solution enters any mains in use.

A disinfection method other than that specified herein may be used by the Contractor provided it meets with the requirements stated above, as well as AWWA Standard C600, and is specifically approved by the Engineer.

2. Water Pipelines

1. Use hypochlorite tablet method, placing tablets in pipe during laying; maintain scrupulous cleanliness during pipe laying so that no trench water or foreign matter enters pipe.
2. Attach tablets of 5G hypochlorite to top of pipe with Permatex No. 1 under tablet only; for each length of pipe use sufficient tablets for a dose of 50 mg/l.
3. When the pipe installation has been completed, fill the main with water, keeping filling velocity less than 1-ft/sec.; allow water to remain in the pipe for at least 24 hours.
4. Pipe, fittings and couplings connecting to an existing main and which cannot be disinfected with a new main, shall be thoroughly swabbed and flushed with strong chlorine solution immediately prior to installation, as should the existing main where exposed.

3. Flushing

After completion of filling, testing, and disinfection, flush heavily chlorinated water from the line by draining at low points until line is completely empty; refill with water and continue to flush main until chlorine residual of less than one mg/l is obtained.

It is the Contractor's responsibility to provide for the adequate and safe disposal of water flushed from mains.

3.13 WATER SERVICE INTERRUPTION, TEMPORARY WATER SERVICE:

Water service interruption shall be kept to a minimum. Contractor shall install and maintain temporary water mains and services at his own expense in order to provide near-continuous water service. All service interruptions shall be coordinated with the Owner.

Material for temporary lines shall be WADOH approved and shall be thoroughly flushed and chlorinated prior to use. Material may be new or used.

Contractor shall provide an individual temporary service for each house or business affected. If more than one service is affected the temporary main shall be a minimum size of 2" diameter.

The Contractor shall obtain prior approval of the use of a fire hydrant for temporary water service.

Contractor shall use the proper wrench for the hydrant and shall be responsible for any damage which occurs to the hydrant.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION OF WORK INCLUDED:

The work described in this Section includes furnishing and installing all water meters, meter settings, boxes, vaults, and any and all other labor, materials and equipment necessary for the proper completion of the system as shown on the plans and described in the specifications.

1.02 QUALITY ASSURANCE:

Meters shall be accepted only from those companies who are actively engaged in the manufacturing of their meters in the United States and who, in the sole judgment of the Owner, have demonstrated satisfactory operation, accuracy and durability. All meters shall be guaranteed against defects in materials and workmanship for a period of one (1) year from date of installation.

All meters shall be as manufactured by Master Meter.

Meters must meet AWWA new meter accuracy requirements. The meters will have an accuracy spread of plus or minus 1% over the normal operating range. All meters will perform to AWWA new meter accuracy standards for a period of 5 years or 500,000 gallons for 5/8", 750,000 gallons for 3/4", and 1,000,000 gallons for 1". The meters will continue to perform to at least AWWA repaired meter accuracy standards for an additional ten (10) years, following the new meter accuracy warranty.

1.03 SUBMITTALS:

Submittals shall conform to Section 01300 of these specifications.

1.04 MATERIAL STORAGE AND HANDLING:

The Contractor shall make his own arrangements for adequate area and access thereto for proper and safe storing and protection of all materials and appurtenances prior to installation. During cold weather, extra care shall be taken in handling all materials.

2.00 PRODUCTS

2.01 WATER METERS, 5/8" - 2":

Meters shall be direct read and have threaded end connections unless otherwise noted. All meters shall conform to AWWA standard C-708 as most recently revised and shall be Magnetic Drive, Sealed Register, Multijet cold water meters. Meters shall be rated at a minimum of 150 psi.

The entire meter exterior (excepting the CI frost bottom), including main case, register box and lid shall be bronze. no external parts may be plastic. All meters shall have a non-corrosive water works bronze outer case with a separate measuring chamber which can be easily removed from the case. All meters shall have cast on them, in raised characters, the size, and direction of flow through the meter. Cast iron frost bottoms, or bronze bottoms shall be provided 5/8", 3/4" and 1". 1 1/2 " and 2"

meters shall be the split case type with bronze lower and upper shell assemblies. All maincases shall be guaranteed against defects in materials and workmanship for twenty-five (25) years from date of shipment. All external bolts and washers shall be of 300 series stainless steel. Full 3/4" meters shall have 7½" laying length.

The register must be of the straight reading type and have a large test or sweep hand and a flow (leak) indicator. It shall read cubic feet. All reduction gearing shall be contained in a permanently hermetically sealed, tamper-proof enclosure made from a corrosion resistant material and will be secured to the upper maincase by means of a locking device located in the interior of the meter so the register cannot be removed externally. The register shall be guaranteed for 25 years.

The bronze register box and lid shall be secured to the maincase by means of a tamper resistant locking device. A locking screw requiring a special manufacturer-supplied tool, or factory installed seal wire, are the only security devices acceptable. Generator registers and remote registers shall be sealed by the Contractor after wiring. The measuring chamber shall be of Water Works bronze or a suitable synthetic polymer and shall not be cast as part of the maincase. All assemblies shall be interchangeable in all measuring chamber assemblies of the same size.

All meters must be provided with a corrosion resistant strainer which is easily removable from the meter without the meter itself being disconnected from the pipeline.

Change gears will not be allowed to calibrate the meter. All registers of a particular registration and meter size shall be identical and completely interchangeable.

## 2.02 TURBINE WATER METERS, 2" - 6":

Meters shall be direct read with flanged connections unless otherwise noted. All meters shall comply with AWWA C-701 as well as all applicable requirements of Paragraph 2.01 of this Section. Strainers shall be of the same manufacturer as the meter, and intended for installation with the specific turbine meter to be installed.

## 2.03 GENERATOR REMOTE TYPE METERS AND REGISTERS:

Shall comply with AWWA C-706 for Direct-Reading Remote Registration Systems. The transmission wire for all meters shall be suitable and warranted for direct burial. After connection, the connection points at both registers shall be completely sealed in a silicon sealant as recommended by the manufacturer. After installation and testing, a tamper-resistant seal wire shall be attached to both registers. Meters shall be of the same manufacturer as all the meters in the project. The operation and accuracy of the generator register assembly shall be fully warranted as required in these specifications when operating in a wet or flooded pit location.

**2.04 CONCRETE METER BOXES:**

Shall be as manufactured by Brooks or Fogtite, or approved equal. Boxes for meter sizes upto and including 1" shall be Brooks 65 Series and boxes 1½" to 2" meters shall be Brooks 66 series (or the equivalent size Fogtite boxes). Concrete boxes shall be provided with cast iron lids, as well as approved traffic rated cast iron covers where applicable, and shall be as shown on the applicable Detail Drawings.

**2.05 RECTANGULAR PLASTIC METER BOXES:**

The meter box shall be high-density Polyethylene of one piece, molded construction for durability. The meter box must have a minimum wall thickness of .550 and have been tested to withstand a 20,000 lb. Vertical load freestanding. All edges shall be clean and smooth for safety during handling. Inner and outer walls are to be smooth with a bright white interior to ease meter reading. The exterior shall be black to retard UV degradation. The meter box shall have a top flange, below the cover seat, to retard "push down" when set in paving and an anti-settling flange on the bottom to help keep the box stable in loose soil, such as occurs in new construction. Boxes shall have a clear open area of approximately 12" x 20", minimum.

The meter box shall be MSBCF style as manufactured by Mid-States Plastics, Inc. or equal

**2.06 INSULATING BLANKET:**

Insulating blankets for meter boxes shall be 5/8" thick cross-linked polyethylene closed-cell insulating material, "XPE" as manufactured by Huls, America or approved equal. The material shall be carefully cut to fit each size meter box for which it is intended and shall not be folded, damaged or creased. Each pad (one per box) shall be a single 5/8" thickness, cut with rounded corners to prevent any opening around the inside edges or corners of the box. For concrete boxes the material shall be cut large enough to fit tightly to support itself. See Detail Drawings.

**2.07 COPPER SETTERS FOR 5/8" - 1" (METER BOX) INSTALLATIONS:**

Shall be of the size and dimensions as required for the applicable meter installation and in accordance with the applicable Detail Drawing, with pack joint end types. Minimum copper setter height shall be 24" from setter inlet centerline to meter inlet centerline.

Copper setters on residential services shall be provided with integral lockwing inlet angle key valve. Copper setters on commercial (including multi-family) services shall be provided with both the specified inlet valve and an angle key outlet valve.

All copper setters shall utilize lead-free solder, have integral saddle nuts and brace pipe eye. Copper setter and type shall provide an electrically conductive connection to copper pipe adequate to conduct high amperage due to service line electrical thawing practices. Copper setters shall be Ford or approved equal.

**2.07 COPPER SETTERS FOR 5/8" - 1" (INTERIOR) INSTALLATIONS:**

Shall be specifically designed for indoor retro-fit installations, and shall be the specific setter type for each particular situations, such as verticals, corners, walls, drops, etc. Setters shall utilize lead-free solder, have integral saddle nuts and shall have end types as required, utilizing pack joints. A minimum 2 gage stranded copper wire and bronze ground clamps shall be provided with each setter to provide electrical ground should the meter be removed. All setters shall have both inlet and outlet key valves, with lock wing on inlet.

Setters shall be as manufactured by Ford or approved equal. Setter size shall be the same as the existing service pipe and/or the required meter size.

**2.08 METER SETTINGS FOR 1½" - 3" METER INSTALLATIONS:**

Shall be individually and custom plumbed for each particular installation using galvanized steel pipe, nipples and fittings. All pipe, nipples and fittings shall be threaded, except the inlet meter valve and outlet fitting shall be thread x meter flange to match the flanged meter. Straight or angle inlet valves may be used as the situations warrant. The inlet valve shall be lockable. The outlet (customer) valve shall be a high quality bronze ball or gate valve with hand wheel, with threaded ends. Inside settings shall be of the same size as existing plumbing and meter to be installed. A minimum 2 gage stranded copper wire and bronze ground clamps shall be provided with each setter to provide electrical ground should the meter be removed. Settings shall be of the same size as existing plumbing and meter to be installed and shall be as shown on the applicable Detail Drawing.

**2.09 OTHER MATERIALS:**

All other materials not specifically described but required for proper completion of the work shall be new, of the highest quality, in conformance with the applicable AWWA standard, and subject to the approval of the Engineer. See Section 02560 for service pipe, curb stops, and pack joint specifications.

**3.00 EXECUTION**

**3.01 TRENCHING, BEDDING, AND BACKFILLING:**

All trenching, bedding, backfilling, and compaction for water meters and appurtenances shall be done in strict conformance to the requirements of Section 02221 of these Specifications.

**3.02 INSPECTION OF MATERIALS:**

All meters and appurtenances shall be inspected before installation for cracks, defects and workability. All dirt, scale, and burrs shall be removed as required for proper installation.

**3.03 METER BOX, CURB STOP, SETTER AND METER INSTALLATION:**

The Contractor shall be responsible for locating existing services.

All meter boxes and setters shall be installed as shown on the applicable Detail Drawing. The compacted gravel base shall be leveled to insure that the meter box is set plumb and on a firm foundation. Excavation and gravel base shall be carefully measured to result in a finished installation with the box cover flush with the surrounding finished grade. In no case shall the box be left in a depression, nor high enough to cause a hazard. Covers shall be set such that the reading lid opening end faces the street.

Meters shall not be installed in setters until the installation has been thoroughly flushed clean. The Contractor shall provide a short hose as required and flush the installation liberally from the City side to the inlet side of the setter. After installation of the meter, the Contractor shall open an outside hose faucet at the residence or business and flush liberally to pull as much of the service pipe debris as possible out of the customer's service line.

The insulating blanket shall be set to fold down at edges and fit tightly in concrete boxes, and loosely (flat) on a stiffener ledge in plastic boxes, about 6" above the meter in both cases. No air gap (to the meter) at the edges or corners shall be evident when the pad is in place.

#### 3.04 LARGE METER VAULT INSTALLATIONS:

The meter vault, assembly, pipe, fittings and appurtenances shall be installed in accordance with the applicable Plans and Detail Drawings, and all applicable specifications.

The Contractor's project schedule shall clearly indicate the approximate planned installation dates. At least 5 days notice shall be given the Owner and affected water customer prior to start of any work. The Contractor's schedule, timing, procedure and operation for each installation shall be approved by both the Owner and customer, and no service shut-off shall be made without 24 hour additional notice.

Vaults shall be installed level, on a well-compacted gravel base.

#### 3.05 INSIDE METER INSTALLATIONS:

All inside meter installation locations and meter sizes shall be approved by the Owner prior to start of work. No service pipe, appurtenance, or building plumbing shall be replaced beyond the immediate limits of the meter setting, nor any changes made to the basic plumbing layout or direction(s) of flow of water, without specific written authorization of the Owner and building owner.

All inside meter installations shall include a minimum 2 gage stranded copper wire and bronze ground clamps installed to provide an electrical ground around the meter in accordance with applicable electrical codes. All inside installations shall include a lockable key inlet meter valve and a bronze hand wheel customer valve, same size as original service pipe or meter setting.

All meters and remote registers shall be installed so as to allow convenient visual reading of both registers. Remote register wire shall be installed neatly in as protected and concealed locations as possible, and stapled carefully at 24" intervals. Prior to acceptance, the generator and remote register

shall be properly and accurately operating.

**3.06 SERVICE LINE REPLACEMENT:**

The Contractor shall not replace any service line outside the limits of the meter box installation as shown on the applicable Detail Drawing unless specific authorization is provided by the Owner or Engineer or otherwise required in the drawings. In cases where a deteriorated iron or steel service line will prevent the connection(s) from being made within these limits, the Engineer or Owner will authorize the Contractor to expose additional service line to the extent necessary to make the installation, if and as determined by the Engineer or Owner.

In no case shall the Contractor proceed further into the private property without the express authorization of the Engineer or Owner and the owner of the affected property.

All work performed under such field direction shall be paid at the price(s) included in the applicable Bid Item(s), and shall be subject to testing and inspection as specified herein.

**3.07 TESTING:**

Testing shall be conducted under normal system operating pressure after all items, including the meter, have been installed. All fittings, joints, couplings and connections shall be exposed for visual inspection for leakage.

Testing shall comply with all requirements of Section 02560 3.11.

**3.08 DISINFECTION:**

Disinfection shall comply with all requirements of Section 02560 3.12.

**END OF SECTION**

1.00 GENERAL

1.01 DESCRIPTION:

This Section includes the work necessary to replace, and restore as required by these Specifications, directed in the field, or as indicated on the Drawings, all pavement, gravel surfacing, curbs and sidewalks damaged either directly or indirectly by the Contractor's operations.

1.02 QUALITY ASSURANCE:

All materials shall comply with the latest version of the WSDOT Standard Specifications and Amendments for Road, Bridge and Municipal Construction.

1.03 SUBMITTALS:

Submittals shall conform to Section 01300 of these Specifications and shall include test results and samples as indicated herein.

2.00 PRODUCTS

2.01 CRUSHED SURFACING:

The material shall consist of uniform quality, clean, tough, durable fragments of rock or gravel, free from flat, elongated, soft or disintegrated pieces and other objectionable matter. Material shall meet the requirements of crushed surfacing specified in WSDOT Standard Specifications and Amendments.

Test results or other evidence satisfactory to the Engineer shall be provided by the Contractor to show that the proposed material meet the requirements prior to material delivery to the project. Provide a physical sample if requested by the Engineer.

Base course and top course material gradation and quality shall comply with the latest WSDOT Standard Specifications and Amendments.

2.02 ASPHALT CONCRETE:

Unless otherwise noted, all asphalt concrete shall be hot plant-mixed bituminous concrete, Class A conforming to the WSDOT Standard Specifications and Amendments. The asphalt concrete base course shall be Class E asphalt concrete conforming to WSDOT Standard Specifications and Amendments. The base course shall only be used as shown on the plans or specified in Section 01010 of these Specifications.

2.03 ASPHALT PRIME (TACK COAT):

Asphalt prime coat shall be liquid CSS-1 or RC-250 emulsified asphalt, or approved equal.

2.04 CONCRETE:

Concrete for curbs, sidewalks, driveways, and other items shall be portland cement concrete with a minimum 28 day compressive strength of 3500 psi, no less than 5-1/2 sacks of cement per cubic yard, and a maximum 3" slump. All concrete shall be air entrained (5%).

### **3.00 EXECUTION**

#### **3.01 GENERAL:**

The Engineer and Owner reserve the right to vary the type of resurfacing as may best serve the interests of the Owner.

All portland cement concrete sidewalks, curbs, driveways and other surfaces shall be formed, placed, consolidated and finished to provide a high quality dense finished surface with the type of finish appropriate for the type of surface. All dimensions shall be accurate, all edges straight and true, and all surfaces free of depressions or high points. All work shall match thickness, elevation and dimensions of existing adjoining surfaces.

Unless otherwise shown on the Drawings, all surfaces damaged by the Contractor's operations shall be repaired or replaced by the Contractor. In addition to the requirements of this Section, all work shall conform to the applicable requirements of WSDOT Standard Specifications and Amendments, and local town and county standards.

#### **3.02 INTERIM SURFACE MAINTENANCE:**

##### **A. Dust Control**

The Contractor's attention is directed to Section 01020 regarding dust control requirements. Following backfill and compaction, excavated areas shall be finish graded level with existing surfaces. Adjacent pavement areas shall be brushed and washed down to remove all soil and rocks. The Contractor shall maintain all backfilled areas to provide a smooth travel surface free of holes, soft spots and rocks. Apply water, dust-palliative or oil as required to adequately control dust as approved by the Engineer or Owner.

##### **B. Maintenance Schedule**

All temporary surfaces shall be maintained and repaired regularly by the Contractor as required to provide a smooth, dust-free roadway surface. During adverse weather, the Contractor shall inspect and repair temporary surfaces weekly.

##### **C. Special Areas**

Pavement replacement in driveways and parking areas shall be done within one (1) week of completion of backfill, unless specific authorization is given otherwise by the Owner or Engineer. All

surface restorations in pedestrian traffic areas shall be made as soon as possible after backfill, in no case later than five (5) days after backfill, unless specific authorization is provided otherwise. In the interim, all driveway, parking area, and pedestrian traffic areas shall be finished with a minimum 2” of compacted crushed rock base course material temporary surface.

D. Roadways

When pavement replacement in roadways is not made within three (3) weeks following backfilling, interim surfacing shall be provided as follows:

1. All excess material shall be removed and adjacent surfaces washed and broomed. The unpaved area shall be given an application of RC-250 asphalt at the rate of 0.2 to 0.3 gallons per square yard, and sufficient aggregate for a “blotter”, which shall serve as temporary pavement replacement until such time as permanent pavement is placed.
2. The temporary surface shall be maintained and repaired as required until the permanent surface is placed.
3. Temporary fill shall be removed as required for installation of permanent surfacing. The Contractor shall be responsible for the proper disposal of all waste material. Such material shall be disposed of at a site procured by the Contractor. The Contractor shall receive prior approval from all applicable local and state agencies, regarding his operations and methods, prior to disposing of waste material.

All costs for all temporary surfacing and its maintenance and removal shall be considered incidental and shall be included in the Bid Items provided for permanent surface replacement.

3.03 ASPHALT CONCRETE PAVEMENT REPLACEMENT:

A. Subgrade

Bring subgrade to a smooth even grade at the specified compaction and at the proper grade for installation of the specified thickness of permanent surfacing materials. Trim existing pavement edges to a straight and vertical edge with a pavement saw or cutter. Remove all damaged, lifted or otherwise unsound remaining pavement to provide a sound edge for joining new pavement.

B. Crushed Surfacing

Place crushed surfacing base course and a minimum of 1” top course material to the depth required as specified in the Drawings or in Section 01010 of these Specifications but in no case less than 4” total depth, and compact to 95% maximum density to provide a smooth unyielding surface.

C. Tack Coat

After crushed surfacing top course has been graded and compacted, and just prior to placing asphalt pavement, apply an asphalt tack coat to all existing pavement edges, valve boxes, manhole covers, curb faces and other appurtenances in the area to be paved.

D. Asphalt Concrete

Place asphalt concrete on the prepared crushed surfacing to a required depth as specified in the Drawings, or in Section 01010 of these Specifications but in no case less than 2". The nominal compacted depth of any layer of any course shall not exceed the depth as specified in the WSDOT Standard Specifications and Amendments. Spread and level with hand tools or a mechanical spreader as required by the area to be paved. Bring asphalt to proper grade and compaction by rolling or the use of adequate hand tampers where rolling is impossible or impractical. Asphalt concrete shall be compacted to a minimum 92.0% Rice Density.

Power rollers shall provide 200 to 300 pounds per lineal inch. Begin rolling from the outside edge of the replacement pavement and work toward the existing pavement, lapping ½ width of the roller.

The finished surface shall be a dense, thoroughly compacted pavement which is hard, smooth, free of roller marks, and shows no appreciable movement under the roller wheels or compactor. It shall be unyielding, true to thickness and grade, free draining and conform to the grade and crown of the adjoining existing pavement.

E. Weather Conditions

Asphalt shall not be applied to saturated material, or during rain, snow, sand or dust storms, or any imminent storms that may adversely affect the finished pavement. Asphalt shall not be placed when (1) the atmospheric temperature is less than 40 degrees F, (2) during heavy rainfall, or (3) when the surface upon which it is to be placed is frozen.

F. Protection of Structures

Provide whatever coverings may be necessary to protect exposed existing structures or improvements of any nature from splashing oil and asphalt. Remove any asphalt or oil that gets on such structures or improvements. Conduct all compaction operations in such a manner and with care to avoid damage to existing structures and improvements.

Where water valve boxes, manholes, catch basins or other such structures are within the area to be paved, the resurfacing shall be flush with the top of the finished elevation of such structures. If it is evident that the existing structure will not be flush with the proposed resurfacing, notify the Engineer or Owner in order that the proper adjustment of such structure can be made prior to resurfacing. Protect all valve box, manhole and catch basin covers during asphalt paving.

G. Curb Exposure

The Contractor shall maintain 6" curb exposure.

Where existing grade is adjusted to obtain required curb exposure, Contractor shall be responsible to maintain existing drainage characteristics throughout the project, although occasional grade revisions may be required to improve drainage and shall be considered incidental to the work.

Where existing curb has irregular grade, pavement shall be placed to result in uniform grade with minimum curb exposure of not less than 3".

H. Surveying Requirements

The Contractor shall utilize a licensed surveyor to re-establish roadway sections and adjust finished grade elevations to accommodate curb exposure, street cross slope requirements and maintain drainage characteristics.

I. Pavement Marking

Contractor shall place temporary spotting or completely re-establish lane markings immediately after pavement replacement. All pavement parking (lane marking, crosswalks, parking markings etc.) shall be permanently re-established with five (5) days of pavement restoration.

J. Excess Materials

Dispose of all excess and waste materials in full accordance with local and state requirements and as specified in Section 02220.

K. Responsibility for Settlement of Surfaces

Settlement of resurfaced areas within the warranty period shall be the sole responsibility of the Contractor. The Contractor shall promptly repair all such areas upon notification from the Engineer or Owner, at no additional cost.

3.04 CONCRETE DRIVEWAYS, SIDEWALKS AND CURBS:

The Contractor shall replace portland cement concrete driveways, sidewalks and curbs to the same section, width, depth, line and grade as that removed or damaged, or as specified in the Drawings. Edges shall be sawcut straight and vertical. Compaction shall be adequate to prevent settlement.

Form construction, placement and finish of concrete shall result in finished work that matches the existing surfaces. Replace concrete between scored or expansion joints, and make replacements to minimize a patched appearance.

Provide a 2” thick compacted base course of crushed rock. Place concrete to the same thickness as the existing or as specified in the Drawings, but not less than 4”. Provide score joints with steel finishing tool, and a full depth expansion joint at adjoining edge with existing concrete.

**3.05 ASPHALT DRIVEWAYS, SIDEWALKS AND PARKING AREAS:**

Asphalt driveways, sidewalks and parking areas shall be replaced as specified above for asphalt concrete pavement replacement.

**3.06 GRAVEL SURFACE REPLACEMENT:**

Replace all existing gravel or crushed rock surfaces with crushed rock as specified for crushed surface base course and top course, to a depth of 4”. Grade smooth and compact to blend smoothly with adjacent areas.

END OF SECTION

**TOWN OF MILLWOOD  
WATER SYSTEM  
STANDARD SPECIFICATIONS**

1.00 GENERAL

1.01 DESCRIPTION:

The work included in this Section includes furnishing and placing grout to fill holes, grout around pipe sleeves, set anchor dowels and bolts, set pump bases and other miscellaneous items of construction as shown on the Drawings.

1.02 QUALITY ASSURANCE:

The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM)

|            |   |
|------------|---|
| ASTM C-191 | Test Method for Time of Setting of Hydraulic Cement by Vicat Needle |
| ASTM C-827 | Test Method for Early Volume Change of Cementitious Mixtures        |
| ASTM D-696 | Test Method for Coefficient of Linear Thermal Expansion of Plastics |

1.03 SUBMITTALS:

Submittals shall conform to Section 01300 of these Specifications.

2.00 PRODUCTS

2.01 CEMENT BASED GROUT:

Grout for sealing holes or openings or setting pump bases shall be Five-Star Grout or approved equal non-metallic non-shrink grout as manufactured by U.S. Grout Corporation. The grout shall show no shrinkage under ASTM C-827 and must contain no expansive cements or metallic powders such as aluminum or iron filings. Grout shall consist of premeasured prepackaged materials supplied by the manufacturer requiring only the addition of water. The manufacturer's instructions printed on the outside of each bag. Water utilized shall be potable. Grout shall exhibit no shrinkage (0.00%) and shall have a maximum expansion of 4.0 percent when tested in accordance with ASTM C-827. The grout shall have a minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C-109, and shall have a minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.

2.02 EPOXY GROUT:

Epoxy grout utilized for anchoring bolts or dowels in existing concrete shall be a pourable, non-shrink epoxy grout containing 100 percent solids. The grout shall be Five Star Epoxy Grout, or approved equal. The epoxy grout system shall be supplied in units consisting of three components, all premeasured and prepackaged. Resin components shall not contain any non-reactive dilutants. The mixed epoxy grout shall have a minimum working life of 45 minutes at 75°F. The grout shall have no

shrinkage (0.00%) and a maximum 4.0 percent expansion when tested in accordance with ASTM C-827, and have a 7-day compressive strength of 10,000 psi when tested in accordance with ASTM D-696, Method B.

**2.03 EPOXY ADHESIVE:**

Epoxy adhesives for bonding pipe or fresh plastic concrete to existing concrete surfaces shall be Sikadur Hi-Mod, as manufactured by Sika Corporation, or approved equal. Grout components shall be prepackaged, two component, ready for field mixing.

**3.00 EXECUTION**

**3.01 CEMENT BASED GROUT:**

Grout shall be mixed in strict accordance with manufacturer's instructions and with a minimum of water. Concrete surface to which it will be applied shall be sandblasted and thoroughly cleaned with water. Concrete surface shall be saturated with water, but free of standing water. Grout shall be thoroughly consolidated in place and free of air voids. Grout surface shall be troweled to a smooth surface and blended with the surround concrete. Grout shall be struck smooth with the edges of pump base plates. Grout shall be cured with wet burlap for a minimum of five days.

Where applicable, pump bases shall be set on anchor bolts that have been set in epoxy grout or cast in concrete floor. Pump bases shall be leveled with nuts on the bolts beneath base plates and set 1.5 inches above the concrete curb. The remaining open space beneath the plates shall then be grouted in place with cement based grout. Extreme care shall be utilized to make sure grout is firmly packed beneath all parts of base plates.

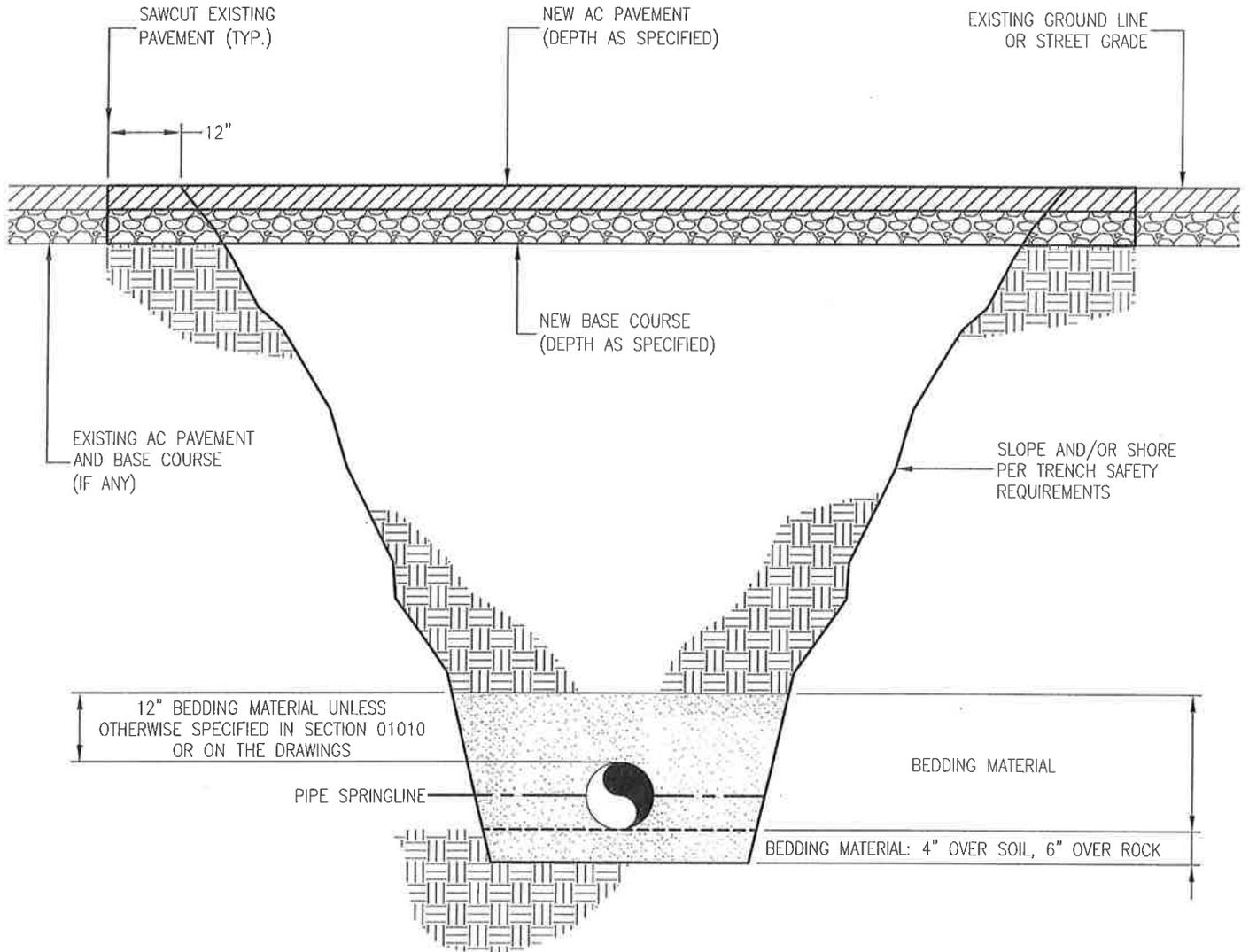
**3.02 EPOXY GROUT:**

All surfaces in contact with grout shall be thoroughly cleaned and completely dry. The grout shall be placed in strict accordance with the manufacturer's instructions. An application tube shall be utilized to pump the grout to the bottom of the annular space around bolts or dowels. The hole shall be filled from the bottom up and from one side to prevent entrapment of air bubbles. The finished surface shall be smooth.

**3.03 EPOXY ADHESIVE:**

The existing surface shall be sandblasted and thoroughly cleaned prior to application of the adhesive. The adhesive shall be supplied in neat form to the prepared surface. Fresh concrete shall be applied while the adhesive is still tacky. A 30-minute delay before pouring the fresh concrete shall be provided if recommended by the manufacturer.

**END OF SECTION**



SEE SECTION 02221

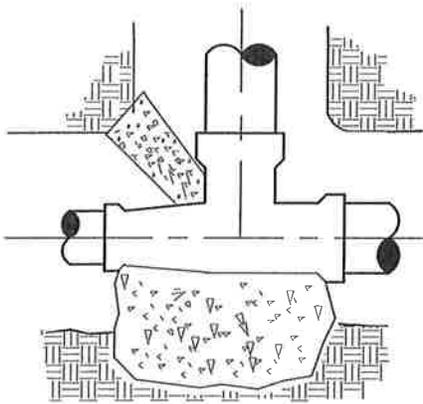
(060605) 02221-1

SCALE: N.T.S.  
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 APPROVED: -  
 PROJ. NO.: 06-06-05  
 DATE: REV. 2/94

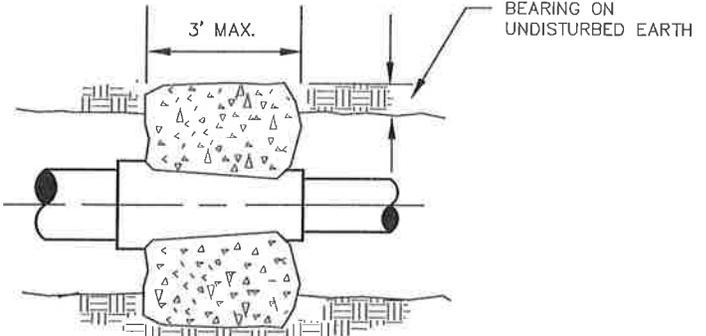
**VA** VARELA AND ASSOCIATES, INC.  
 ENGINEERING AND MANAGEMENT

MILLWOOD STANDARD

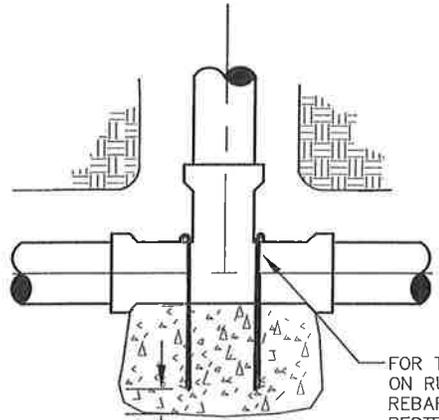
TRENCH EXCAVATION



TEE REDUCING IN LINE



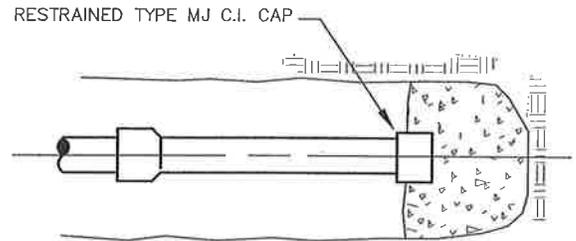
REDUCER



TEE

FOR TEES WITH FLANGED VALVE(S) ON RUN INSTALL 2 #5 EPOXY COATED REBAR AROUND FITTING FOR LATERAL RESTRAINT. BARS SHALL BE HOOKED AND SET 18" MIN. IN CONC. FIT SNUG ON FITTING, AND EPOXY CHIPS TOUCHED UP.

MIN. 3" CONC. COVER (TYP.)

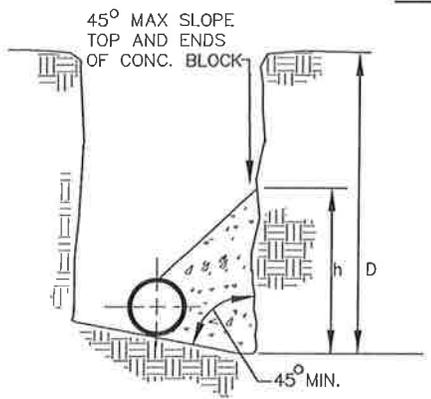


CAPPED END

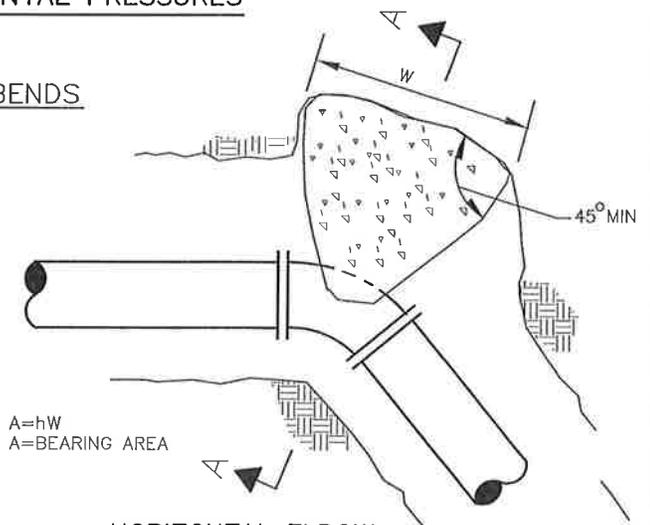
THRUST BLOCK LAYOUT FOR HORIZONTAL PRESSURES

CRITERIA FOR HORIZONTAL BENDS

"h" IS LESS THAN OR EQUAL TO ONE HALF OF "D"  
 "W" SHALL BE GREATER THAN "h" BUT LESS THAN 2 TIMES "h".



SECTION A-A THRUST BLOCK



HORIZONTAL ELBOW

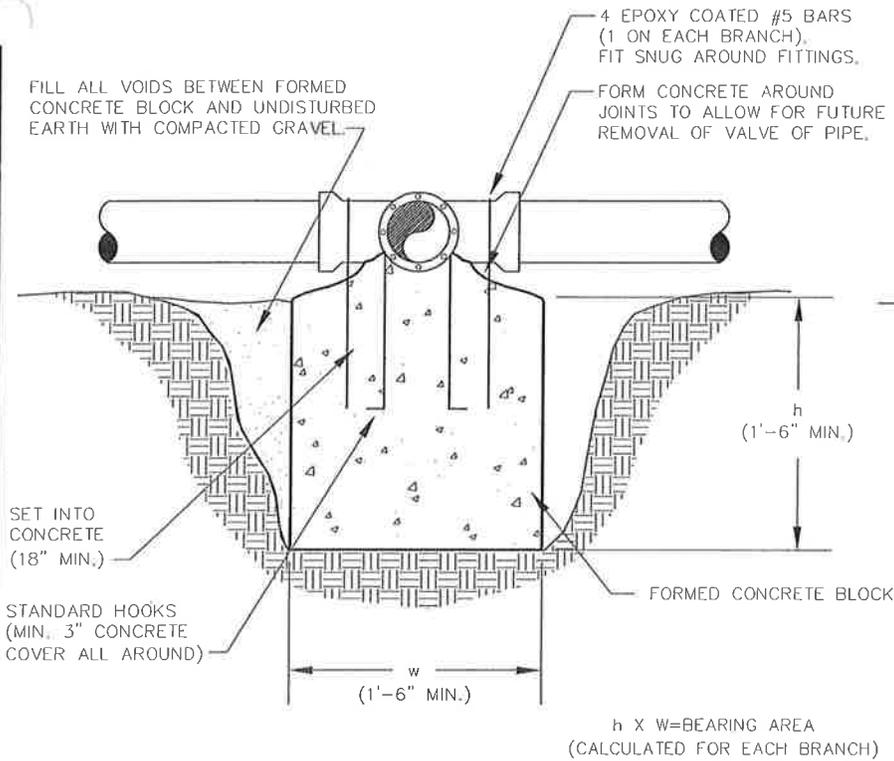
A=hW  
 A=BEARING AREA

HORIZONTAL BENDS

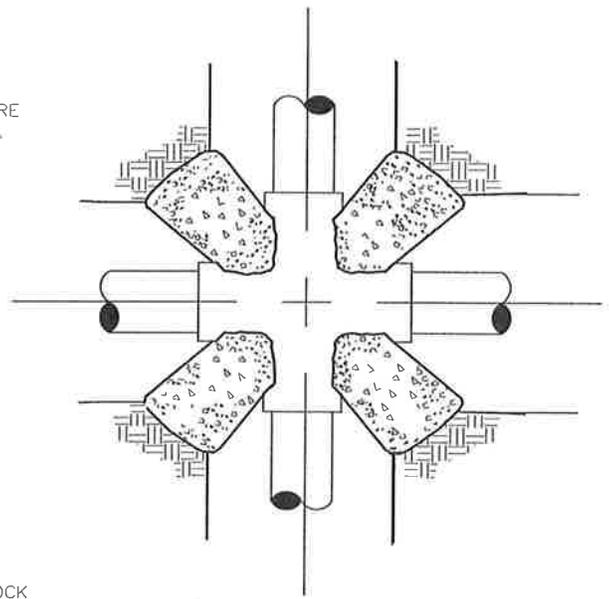
NOTES

1. THIS DETAIL DRAWING APPLICABLE FOR FITTINGS OF ALL END TYPES.
2. ALL CONCRETE THRUST BLOCKS SHALL BE ADEQUATELY CONSOLIDATED IN PLACE.
3. SEE TABLE FOR MINIMUM BEARING AREA REQUIREMENTS.

REV. 2/28/95

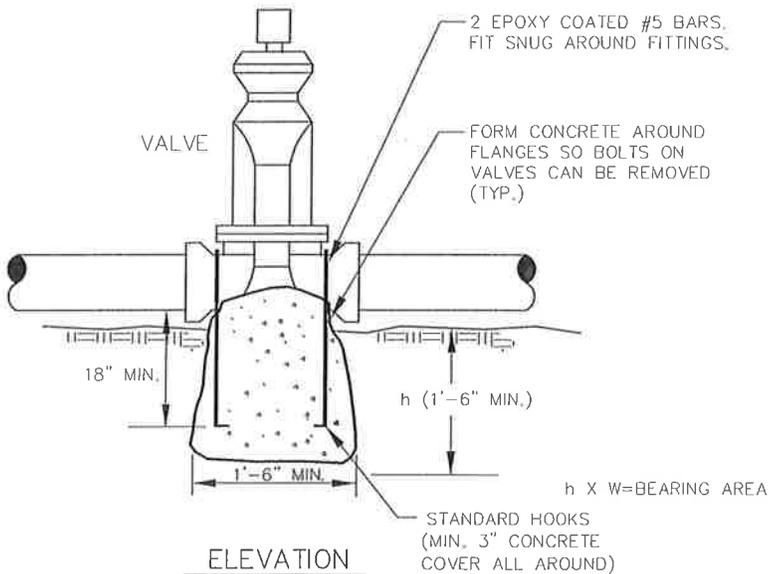


ALTERNATE CROSS THRUST BLOCK

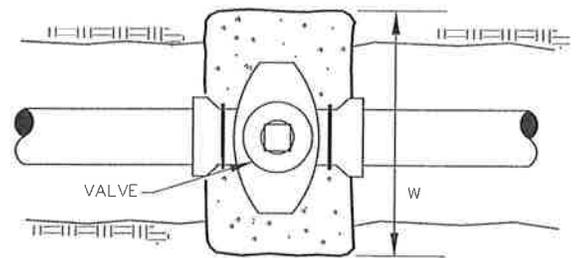


STANDARD CROSS THRUST BLOCK

CROSS



ELEVATION

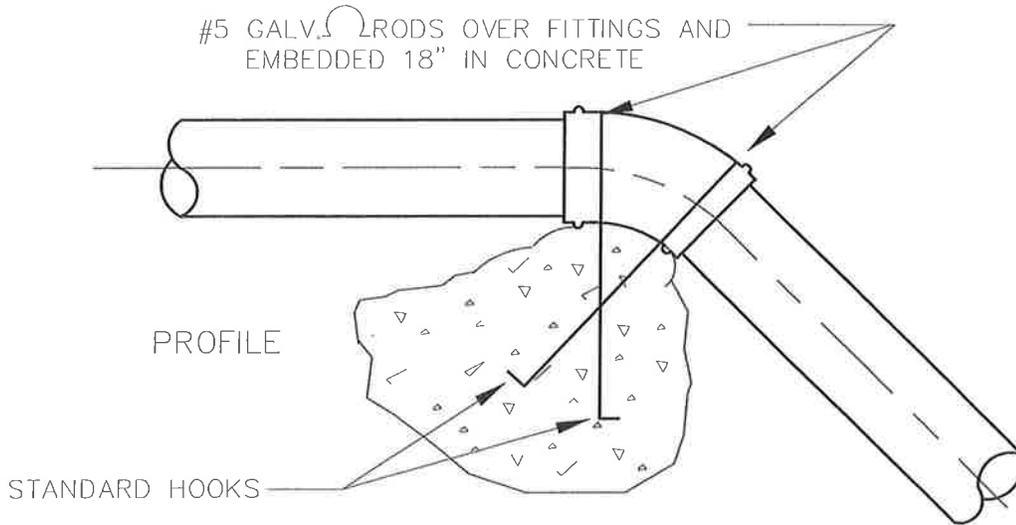


PLAN

VALVE ON RUN

- NOTES: 1. THIS DETAIL DRAWING APPLICABLE FOR ALL FITTINGS OF ALL END TYPES.  
 2. ALL CONCRETE THRUST BLOCKS SHALL BE ADEQUATELY CONSOLIDATED IN PLACE.  
 3. SEE TABLE FOR MINIMUM BEARING AREA REQUIREMENTS.

REV. 3/7/95



1. KEEP CONCRETE CLEAN OF JOINT AND JOINT ACCESSORIES
2. THE REQUIRED THRUST BLOCK VOLUMES FOR SPECIAL CONNECTIONS ARE TO BE SHOWN ON THE PLAN; e.g. 6 INDICATES 6 CUBIC YARDS OF CONCRETE ARE REQUIRED.
3. IF NOT SHOWN ON PLANS, REQUIRED VOLUMES AT FITTINGS SHALL BE AS INDICATED BELOW, ADJUSTED IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) STATED IN THE SPECIAL SPECIFICATIONS.
4. VOLUMES AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER VOLUMES AND THE BLOCKING DETAIL SHOWN ON THIS STANDARD DETAIL.
5. THRUST BLOCKS FOR VERTICAL UP-BENDS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.

| FITTINGS SIZE | VOLUME OF THRUST BLOCK IN CU. YDS. |          |              |              |
|---------------|------------------------------------|----------|--------------|--------------|
|               | 90° BEND                           | 45° BEND | 22 1/2° BEND | 11 1/4° BEND |
| 4             | .8                                 | .4       |              |              |
| 6             | 1.8                                | .9       | .4           |              |
| 8             | 3.2                                | 1.7      | .8           | .3           |
| 10            | 4.9                                | 2.6      | 1.3          | .5           |
| 12            | 7.0                                | 3.7      | 1.8          | .8           |
| 14            | 9.5                                | 5.0      | 2.5          | 1.2          |
| 16            | 12.0                               | 6.4      | 3.1          | 1.4          |

NOTE: ABOVE VOLUMES BASED ON TEST PRESSURES OF 150 p.s.i. AND THE WEIGHT OF CONCRETE= 4050lb./cu.yd. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION- VOLUME= (TEST PRESSURE/150) X (TABLE VALUE)

REV. 2/94

**THRUST BLOCK MINIMUM BEARING AREA \***  
 (SQ. FT. AT 100/150/200 PSI PRESSURE)

| SIZE PIPE | TEE W/VALVE(S) ON RUN, 90° EL |                         |                         | 45° EL                  |                         |                         | 22-1/2° & 11-1/4° EL    |                         |                         | VALVES, DEAD ENDS TEE W/O VALVE ON RUN |                         |                         |
|-----------|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--|-------------------------|-------------------------|
|           | @ 100 PSI TEST PRESSURE       | @ 150 PSI TEST PRESSURE | @ 200 PSI TEST PRESSURE | @ 100 PSI TEST PRESSURE | @ 150 PSI TEST PRESSURE | @ 200 PSI TEST PRESSURE | @ 100 PSI TEST PRESSURE | @ 150 PSI TEST PRESSURE | @ 200 PSI TEST PRESSURE | @ 100 PSI TEST PRESSURE                | @ 150 PSI TEST PRESSURE | @ 200 PSI TEST PRESSURE |
| 4         | 2                             | 3                       | 4                       | 2                       | 3                       | 4                       | 2                       | 3                       | 4                       | 2                                      | 3                       | 4                       |
| 6         | 4                             | 6                       | 8                       | 2                       | 3                       | 4                       | 2                       | 3                       | 4                       | 3                                      | 4.5                     | 6                       |
| 8         | 6                             | 9                       | 12                      | 4                       | 6                       | 8                       | 2                       | 3                       | 4                       | 5                                      | 7.5                     | 10                      |
| 10        | 9                             | 13.5                    | 18                      | 5                       | 7.5                     | 10                      | 2                       | 3                       | 4                       | 7                                      | 10.5                    | 14                      |
| 12        | 13                            | 19.5                    | 26                      | 7                       | 10.5                    | 14                      | 4                       | 6                       | 8                       | 10                                     | 15                      | 20                      |
| 14        | 18                            | 27                      | 36                      | 10                      | 15                      | 20                      | 5                       | 7.5                     | 10                      | 13                                     | 19.5                    | 26                      |

\* SOIL BEARING CAPACITY 1500 PSF PRIOR TO BACKFILL

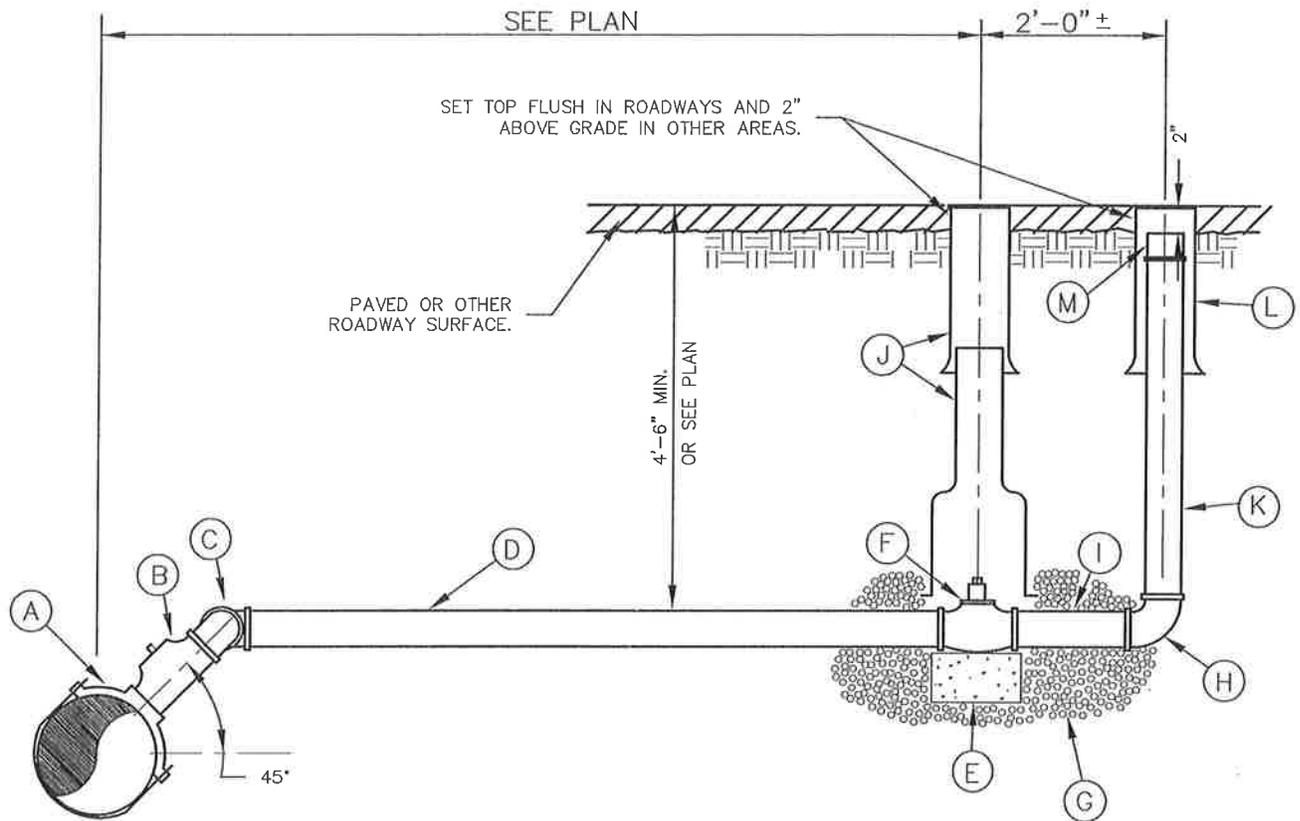
NOTES:

1. ALL TIE BARS SHALL BE AS SPECIFIED ON DET. 02560-1 (SERIES) DRAWINGS.
2. FOR PRESSURES OTHER THAN SHOWN ABOVE MULTIPLY BY A RATIO TO THE 100psi COLUMN (i.e.  $\frac{\text{PRESSURE}}{100\text{psi}}$ )



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**THRUST BLOCK  
 MINIMUM BEARING AREA**



LIST OF MATERIALS

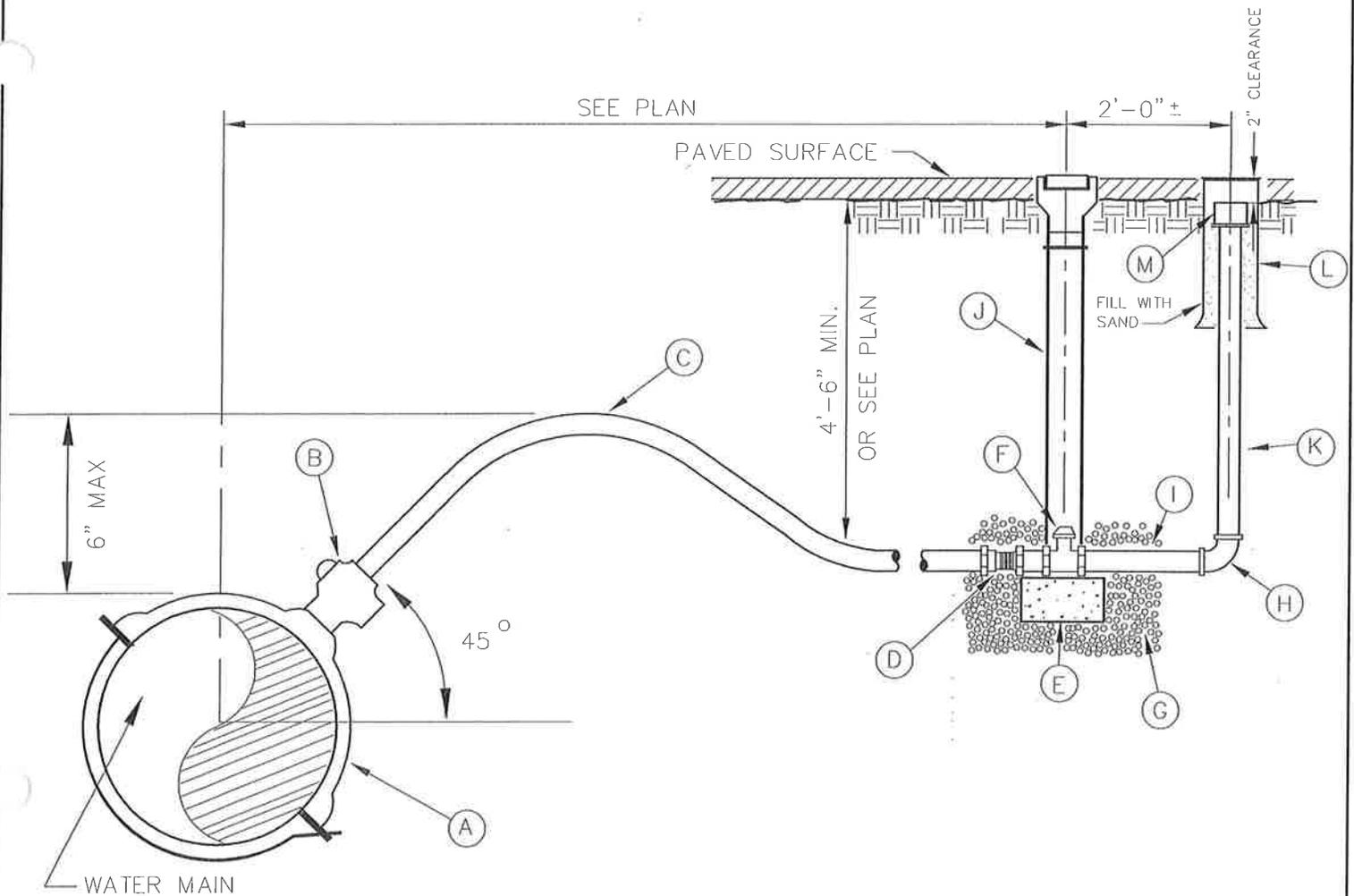
- A. 2" D.I. DOUBLE STRAP SERVICE SADDLE (OR 2" WIDE STRAP FOR PVC MAINS)
- B. CORPORATION STOP
- C. 2" SWIVEL JOINT (2-90° ELS W/PIPE NIPPLE)
- D. 2" X VARIABLE LENGTH SCHEDULE 40 GALVANIZED STEEL PIPE
- E. CONCRETE BLOCK (MIN. 3" THICK)
- F. 2" BRONZE STOP & DRAIN (MUELLER H10284 ORISEAL)
- G. 5 CUBIC FEET WASHED GRAVEL
- H. 2" X 90° GALVANIZED STEEL ELBOW
- I. 2" X VARIABLE LENGTH GALVANIZED STEEL SPOOL, SCHEDULE 40
- J. CAST IRON VALVE BOX
- K. 2" X VARIABLE LENGTH SCHEDULE 40 GALVANIZED STEEL PIPE
- L. CAST IRON VALVE BOX TOP SECTION ONLY, MINIMUM INSIDE DIA. 5 1/4"
- M. 2" GALVANIZED STEEL SCHEDULE 40 CAP

NOTE: 1-1/2" BLOW OFF ASSEMBLIES SHALL BE SIMILAR.

SCALE: N.T.S.  
 REVISED BY: MWM  
 DRAWN: JSM  
 CHECKED:  
 APPROVED:  
 REVISED: 6/30/98

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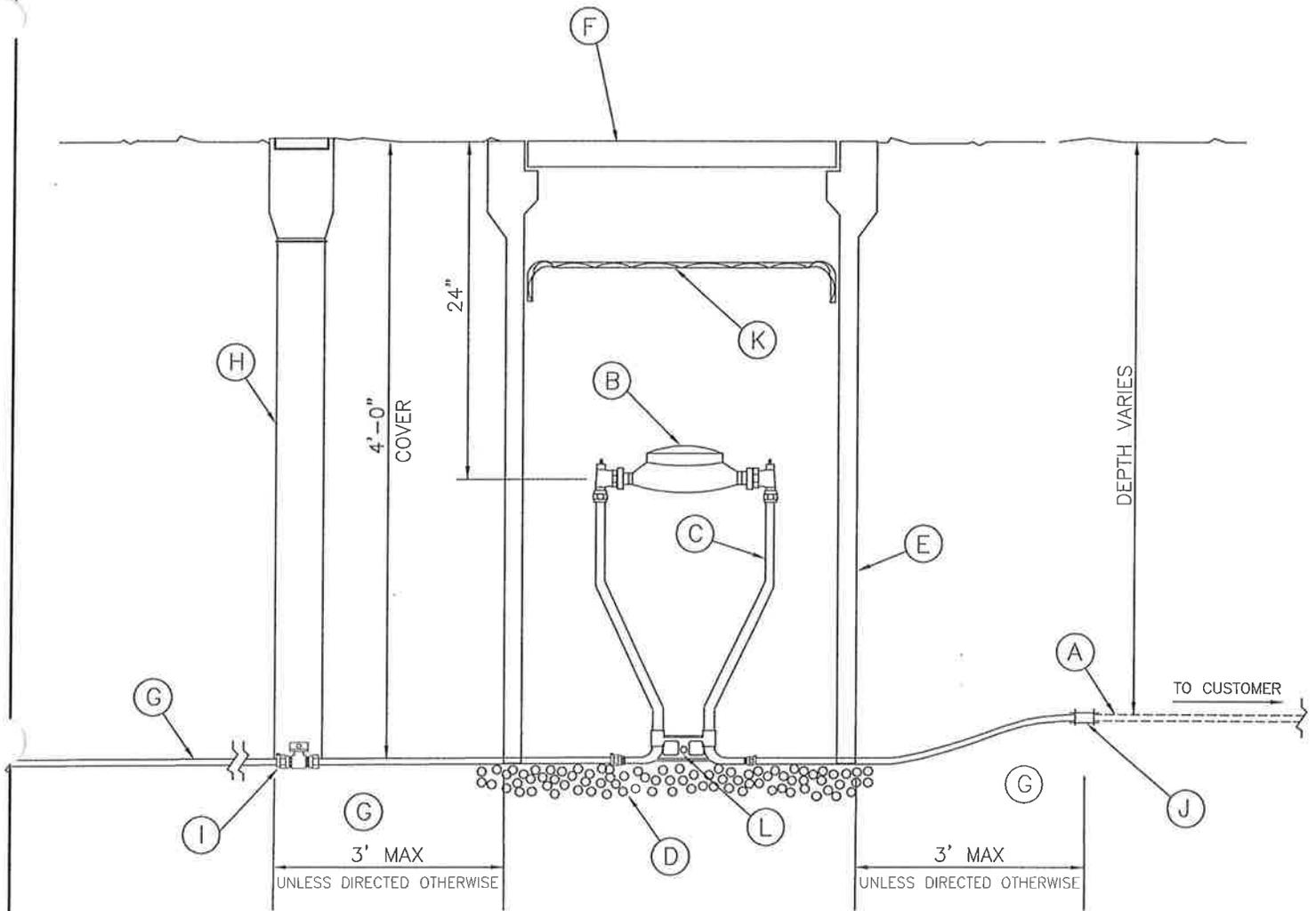
1-1/2", 2" BLOW OFF ASSEMBLY



LIST OF MATERIALS  
(SEE SPECIFICATIONS IN SECTION 02560)

- A. SERVICE SADDLE
- B. CORPORATION STOP
- C. TYPE K COPPER, LENGTH AS REQUIRED.
- D. PACK JOINT OR COMPRESSION COUPLING.
- E. CONCRETE BLOCK (MIN. 3" THICK)
- F. 1" BRONZE STOP & DRAIN
- G. 2 CUBIC FEET WASHED GRAVEL
- H. 1" X 90° GALVANIZED STEEL ELBOW
- I. 1" X VARIABLE LENGTH GALVANIZED STEEL SPOOL, SCHEDULE 40
- J. TWO PIECE ADJUSTABLE C.I. CURB BOX WITH LID.
- K. 1" X VARIABLE LENGTH SCHEDULE 40 GALVANIZED STEEL PIPE
- L. CAST IRON VALVE BOX FLANGED TOP SECTION ONLY WITH LID, MINIMUM INSIDE DIA. 5 1/4"
- M. 1" GALVANIZED STEEL SCHEDULE 40 CAP

REV. 3/6/95



- A - EXISTING SERVICE PIPE TO CUSTOMER. (DEPTH, SIZE AND MATERIAL VARIES)
- B - WATER METER
- C - COPPERSETTER
- D - 3" THICK COMPACTED GRAVEL BASE, 3/4" MINUS CRUSHED ROCK.
- E - METER BOX.
- F - COVER (AS REQUIRED AND APPROVED FOR TRAFFIC AREAS) WITH READING LID.
- G - 1" TYPE K COPPER TUBING FROM WATER MAIN.
- H - TWO PIECE ADJUSTABLE C.I. CURB BOX.
- I - CURB STOP
- J - PACK JOINT
- K - INSULATING BLANKET (IF APPLICABLE)
- L - 12" LONG PVC OR COPPER BRACE PIPE IN PIPE EYE.

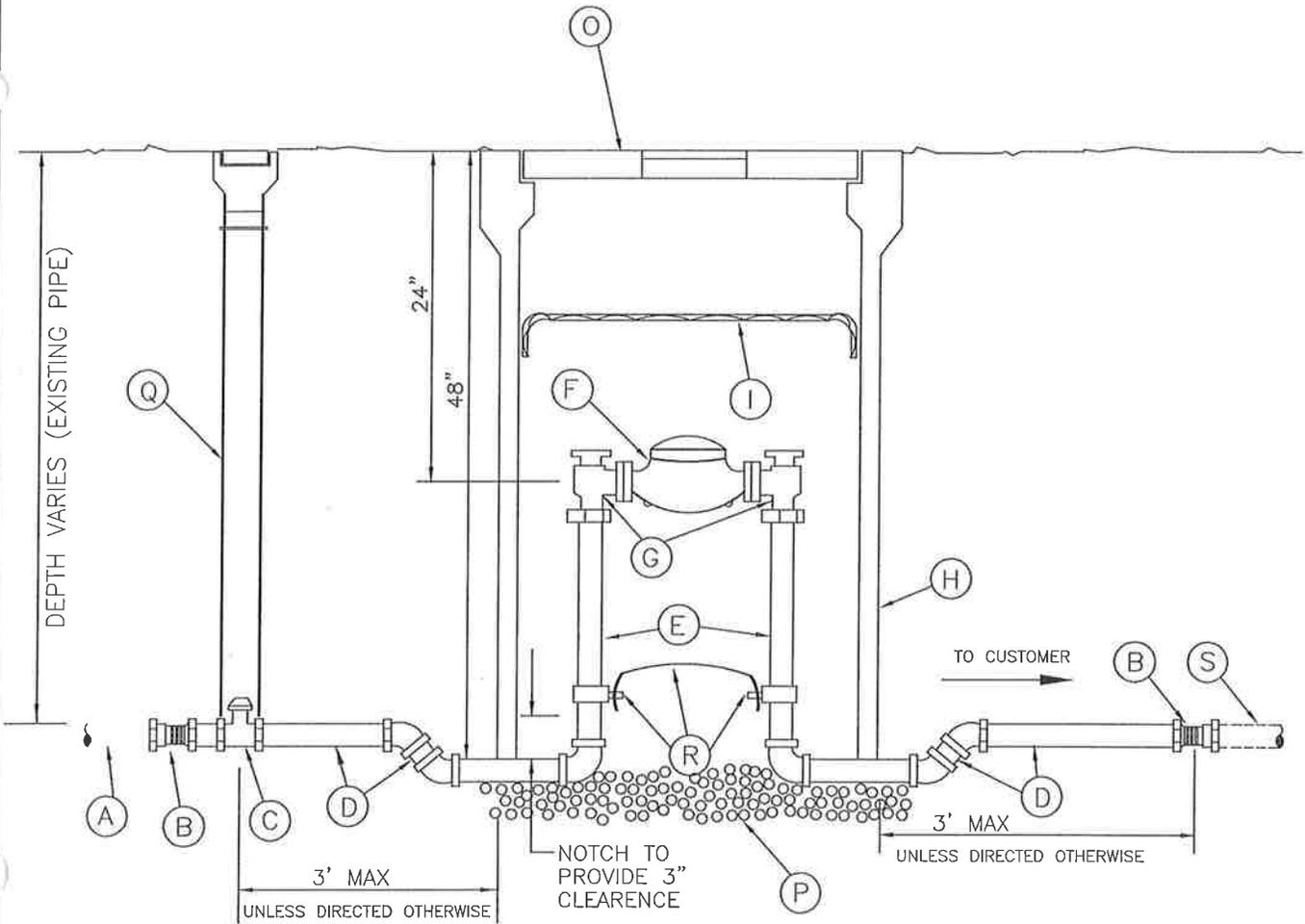
02560-5

SCALE: N.T.S.  
 DESIGNED: -  
 DRAWN: RDC  
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 APPROVED:  
 PROJ. NO.: 06-06-05  
 DATE: 04/10/02

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 ENGINEERING AND MANAGEMENT

MILLWOOD STANDARD

3/4" AND 1" METER DETAIL



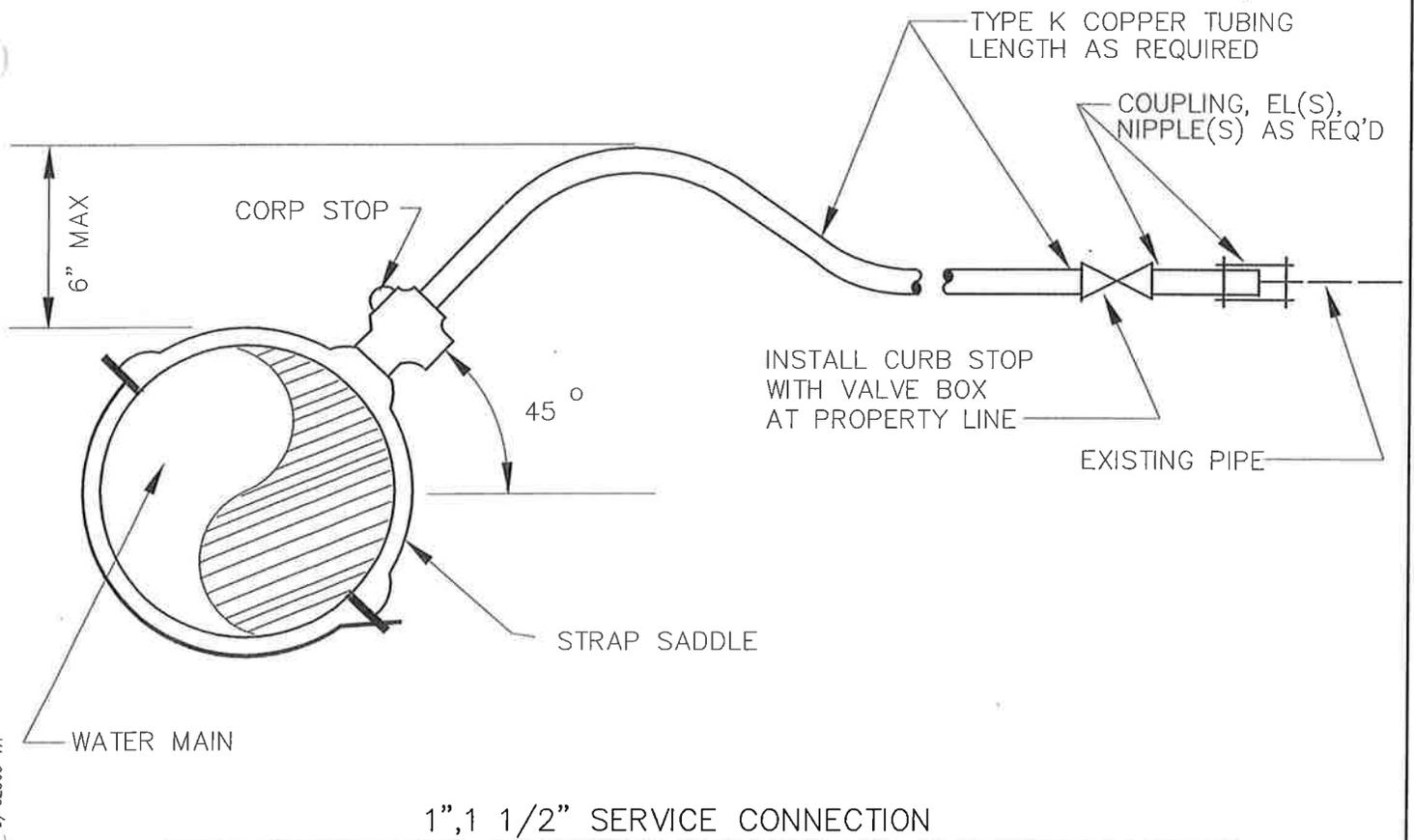
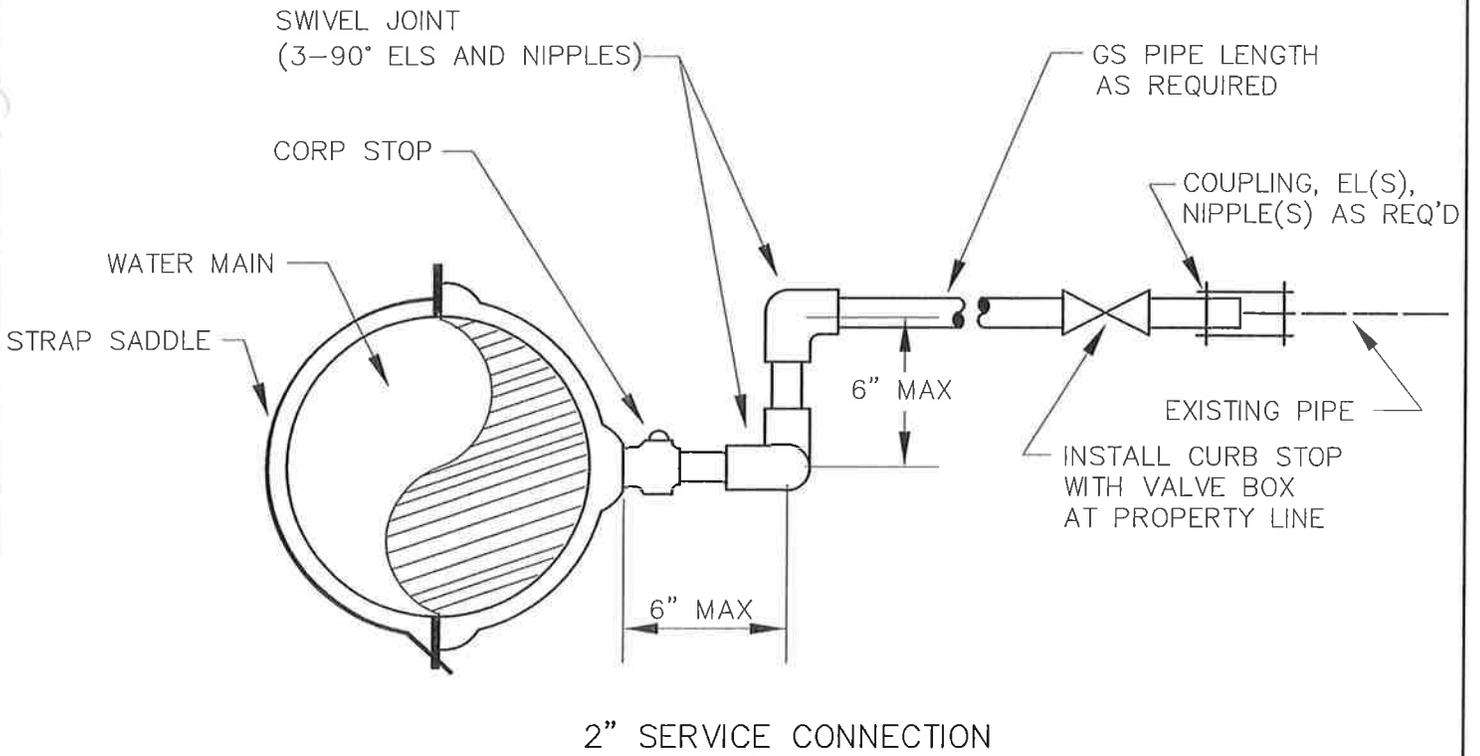
- A - EXISTING SERVICE PIPE FROM MAIN (DEPTH, SIZE AND MATERIAL VARIES, NOT INCLUDED IN METER DET.).
- B - PACK JOINT COUPLING (IPT X PACK JOINT).
- C - CURB STOP.
- D - GALV. STEEL NIPPLES AND FITTINGS AS REQUIRED TO ADJUST ELEVATION AND ALIGNMENT.
- E - GALV. STEEL PIPE AND FITTINGS FOR METER RISER.
- F - WATER METER
- G - ANGLE METER VALVE, IPT X METER FLANGE.
- H - METER BOX
- I - INSULATING BLANKET
- O - COVER (AS REQUIRED AND APPROVED FOR TRAFFIC AREAS) WITH READING LID.
- P - 3" THICK COMPACTED GRAVEL BASE, 3/4" MINUS CRUSHED ROCK.
- Q - TWO PIECE ADJUSTABLE C.I. CURB BOX.
- R - 4/0 BARE STRANDED COPPER WIRE AND 2 GROUND CLAMPS
- S - SERVICE PIPE TO CUSTOMER (DEPTH, SIZE AND MATERIAL VARIES, NOT INCLUDED IN METER DETAIL).

02560-6

SCALE: N.T.S.  
 DESIGNED: -  
 DRAWN: RDC  
 CHECKED:  
 APPROVED:  
 PROJ. NO.: 06-06-05  
 DATE: 04/10/02

**VARELA AND ASSOCIATES, INC.**  
 ENGINEERING AND MANAGEMENT

**MILLWOOD STANDARD**  
**1-1/2" AND 2" METER DETAIL**

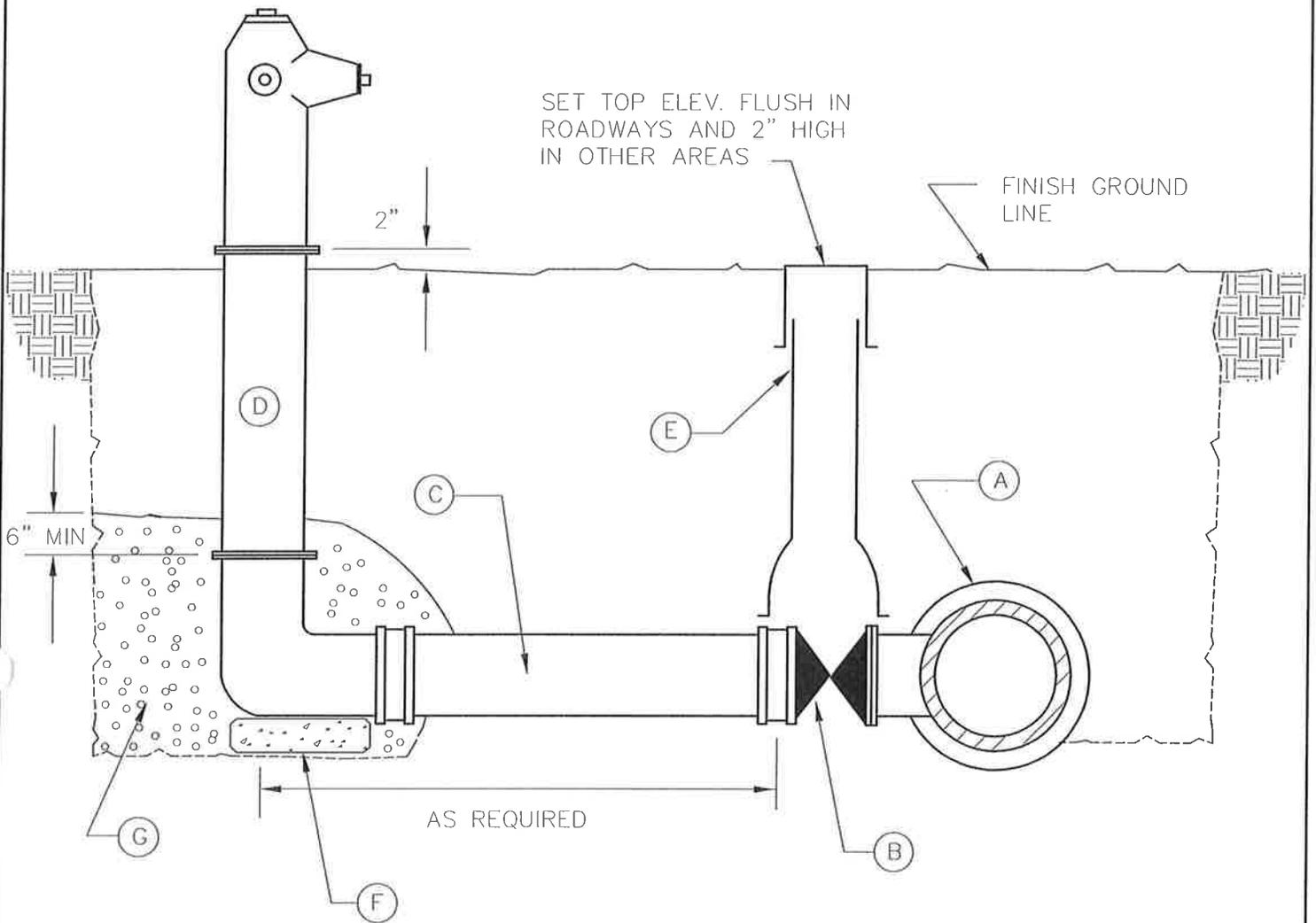


02560-7A

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 DRAWN: RDC  
 CHECKED: -  
 APPROVED: -  
 PROJ. NO.: 06-06-05  
 DATE: REV. 3/1/94

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 ENGINEERING AND MANAGEMENT

MILLWOOD STANDARD  
 SERVICE CONNECTIONS



LIST OF FITTINGS

- A. 1 EA. MAIN SIZE X MAIN SIZE X 6" C.I. OR D.I. TEE  
(FL SIDE OUTLET, ON RUN JOINT TYPE MAY VARY)
- B. 1 EA. 6" RSGV, FL X MJ
- C. 1 EA. 6" X LENGTH AS REQUIRED D.I. PIPE, P.E X P.E.  
(USE RESTRAINED JOINT IF MORE THAN 1 PIECE REQUIRED.)
- D. 1 EA. FIRE HYDRANT, M.J. INLET
- E. 1 EA. C.I. VALVE BOX
- F. 1 EA. 15" X 4" CONCRETE BLOCK SET IN COMPACTED FOUNDATION
- G. 1/2 C.Y. 3" TO 3/8" CLEAN GRAVEL AROUND DRAIN

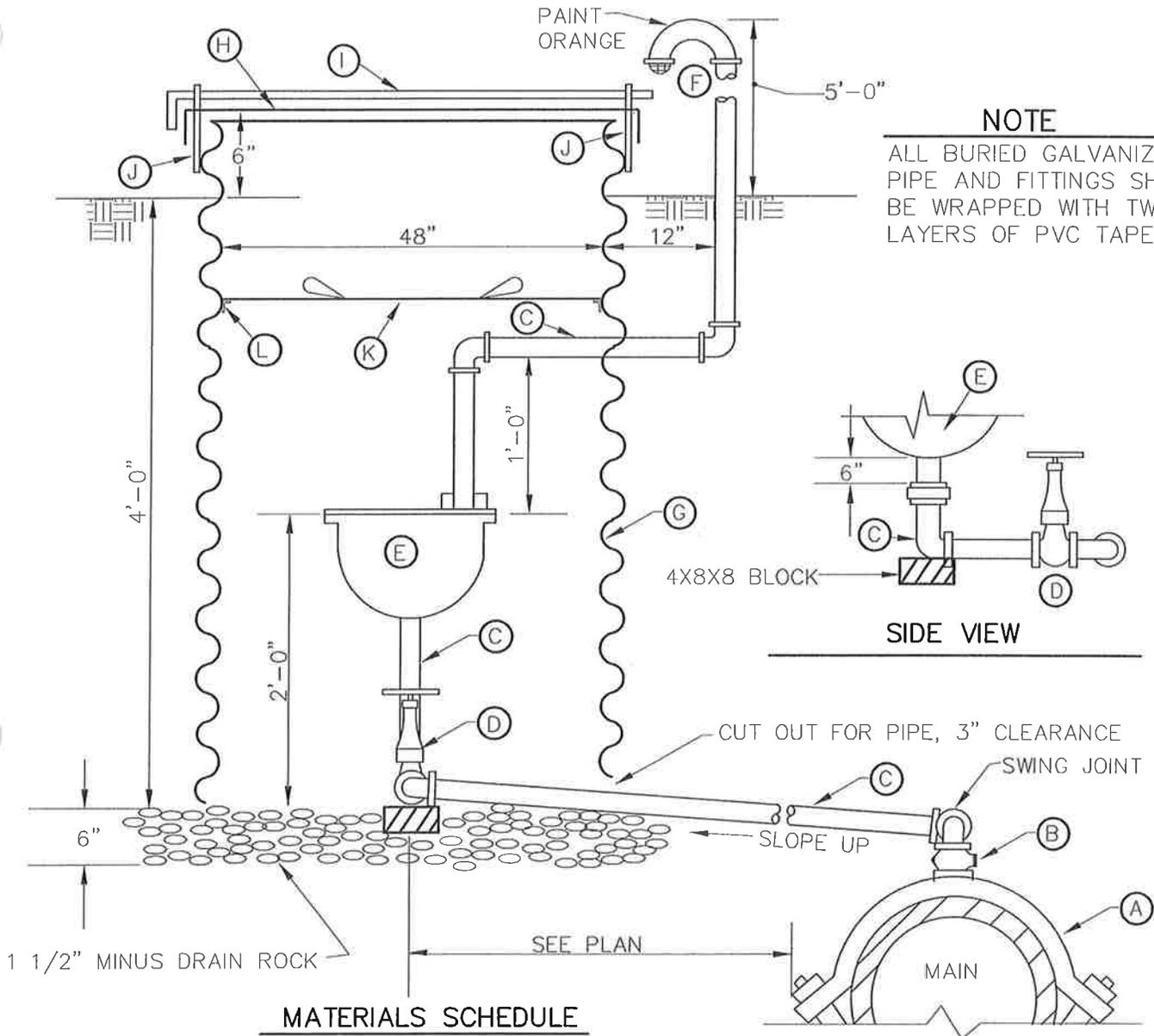
NOTE: ALL MJ JOINTS SHALL BE RESTRAINED TYPE

02560-8

SCALE: N.T.S.  
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 DRAWN: RDC  
 CHECKED:  
 APPROVED:  
 PROJ. NO.: 06-06-05  
 DATE: REV. 2/95

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 ENGINEERING AND MANAGEMENT

**MILLWOOD STANDARD**  
**FIRE HYDRANT ASSEMBLY**



**NOTE**

ALL BURIED GALVANIZED PIPE AND FITTINGS SHALL BE WRAPPED WITH TWO LAYERS OF PVC TAPE.

**SIDE VIEW**

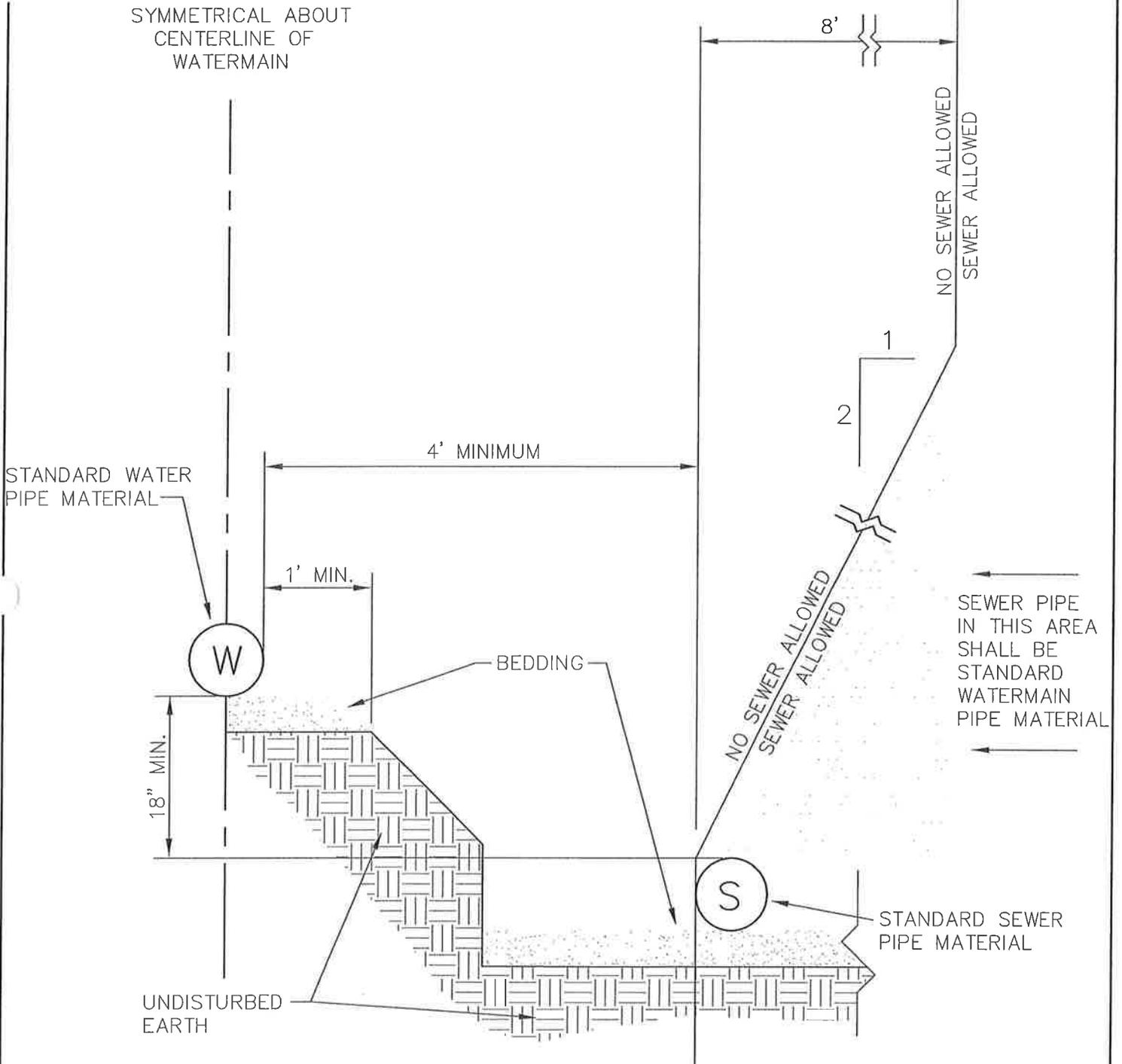
**MATERIALS SCHEDULE**

- A. DI SADDLE FOR WATER MAIN. (SEE DRAWINGS FOR MAIN SIZE)
- B. BRONZE CORP STOP. (SAME SIZE AS AIR VALVE, USE 2" CORP STOP FOR 2" & 3" AIR VALVES)
- C. GALVANIZED STEEL PIPE, ELS, NIPPLES, UNIONS AS REQUIRED. (SAME SIZE AS AIR VALVE)
- D. PIPE SIZED BRONZE GATE VALVE W/HANDWHEEL.
- E. COMBINATION AIR VALVE. (SEE DRAWINGS FOR SIZE AND MODEL)
- F. PIPE SIZED GALVANIZED SCREENED VENT CAP.
- G. 48" DIA. CORRUGATED ALUMINUM CULVERT PIPE
- H. 52" DIA. X 1/4" ALUMINUM PLATE COVER WITH 2" HIGH RIM ALL AROUND (CONFIRM DIAMETER)
- I. 3/4" DIA. SMOOTH ROUND STEEL BAR WITH 3" HOOK, AND 5/16" DIA. HOLE AT STRAIGHT END (FOR PADLOCK). LENGTH AS REQUIRED. GALVANIZE AFTER FABRICATION.
- J. 2 EA. 2" X 9" X 1/4" GALVANIZED STEEL PLATES WITH 1" DIA. HOLE TO RECEIVE BAR. BOLT TO CULVERT PIPE.
- K. INSULATE INTERIOR W/4" THICK RIGID HIGH DENSITY INSULATION PAD CUT TO FIT SNUG (W/ LIFTING HANDLES).
- L. 1-1/2" X 1-1/2" X 4" ANGLE IRON SPACED EQUALLY 4 PLACES. GALVANIZE AFTER FABRICATION.

SCALE: N.T.S.  
 DESIGNED: MWM  
 DRAWN: JSM  
 CHECKED:  
 APPROVED:  
 PROJ. NO.: 10-00-00  
 DATE: 06/03

**VARELA AND ASSOCIATES, INC.**  
 ENGINEERING AND MANAGEMENT

**COMBINATION AIR VACUUM RELIEF STATION**  
 2" - 3"  
 (NON-TRAFFIC)



PARALLEL CONSTRUCTION  
WITH LESS THAN 10 FT SEPARATION

NOT TO SCALE

02575-4

SCALE: N.T.S.  
 DESIGNED: -  
 DRAWN: RDC  
 CHECKED:  
 APPROVED:  
 PROJ. NO.: 06-06-05  
 DATE: REV. 2/24/94

**VA** VARELA AND ASSOCIATES, INC.  
 ENGINEERING AND MANAGEMENT

MILLWOOD STANDARD  
 WATER SEWER SEPERATION  
 (UNUSUAL CONDITIONS)

