TOWN OF SMYRNA
(RUTHERFORD COUNTY, TENNESSEE)

WATER SYSTEM
STANDARD SPECIFICATIONS
FOR
NEW CONSTRUCTION

HONORABLE MARY ESTHER REED, MAYOR
DAVID SANTUCCI, TOWN MANAGER
MICHAEL STRANGE, DIRECTOR OF UTILITIES

APPROVED BY: Mike Strange

TITLE: DIRECTOR OF UTILITIES DATE: 5-8-2025

Dated: May 8, 2025

DW20250535

APPROVED WATER SPECIFICATIONS

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

AND IS HEREBY APPROVED FOR USE IN CONSTRUCTION BY THE COMMISSIONER

Kaylee Sabo
06/18/2025

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS - WATER LINE ADDITIONS

TECHNICAL SPECIFICATIONS - WATER LINE ADDITIONS

TECHNICAL SPECIFICATIONS - WATER LINE ADDITIONS

TECHNICAL SPECIFICATIONS - WATER LINE ADDITIONS

GENERAL CONDITIONS

TABLE OF CONTENTS

GENERAL CONDITIONS

TABLE OF CONTENTS

GC-1 **DEFINITIONS**

GC-1.01 Wherever used in the **CONTRACT DOCUMENTS**, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

GC-1.02 **ADDENDA** - Written or graphic instruments issued prior to the execution of the Agreement, which modify or interpret the **CONTRACT DOCUMENTS, DRAWINGS** and **SPECIFICATIONS**, by additions, deletions, clarifications or corrections.

GC-1.03 **BID** - The offer or proposal of the **BIDDER** submitted on the prescribed form setting forth the prices for the **WORK** to be performed.

GC-1.04 **BIDDER** - Any person, firm or corporation submitting a **BID** for the **WORK**.

GC-1.05 **BONDS** - Bid, Performance, and Payment Bonds and other instruments of security, furnished by the **CONTRACTOR** and his security in accordance with the **CONTRACT DOCUMENTS**.

GC-1.06 **CHANGE ORDER** - A written order to the **CONTRACTOR** authorizing an addition, deletion or revision in the **WORK** within the general scope of the **CONTRACT DOCUMENTS**, or authorizing an adjustment in the **CONTRACT PRICE** or **CONTRACT TIME**.

GC-1.07 **CONTRACT DOCUMENTS** - The contract, which includes Advertisement for Bids, Information for Bidders, **BID**, Bid Bond, Agreement, Payment Bond, Performance Bond, **NOTICE TO AWARD, NOTICE TO PROCEED, CHANGE ORDER, DRAWINGS, SPECIFICATIONS**, and **ADDENDA**.

GC-1.08 **CONTRACT PRICE** - The total monies payable to the **CONTRACTOR** under the terms and conditions of the **CONTRACT DOCUMENTS**.

GC-1.09 **CONTRACT TIME** - The number of calendar days stated in the **CONTRACT DOCUMENTS** for the completion of the **WORK**.

GC-1.10 **CONTRACTOR** – The person, firm or corporation with whom the **OWNER** has executed the Agreement.

GC-1.11 **DRAWINGS** – The part of the **CONTRACT DOCUMENTS**, which show the characteristics and scope of the **WORK** to be performed and which have been prepared or approved by the **ENGINEER**.

GC-1.12 **ENGINEER** – The person, firm or corporation named as such in the **CONTRACT DOCUMENTS**.

GC-1.13 **FIELD ORDER** – A written order effecting a change in the **WORK** not involving an adjustment in the **CONTRACT PRICE** or an extension of the **CONTRACT TIME**, issued by the **ENGINEER** to the **CONTRACTOR** during construction.

GC-1.14 **NOTICE OF AWARD** – The written notice of the acceptance of the **BID** from the **OWNER** to the successful **BIDDER**.

GC-1.15 **NOTICE TO PROCEED** – Written communication issued by the **OWNER** to the **CONTRACTOR** authorizing him to proceed with the **WORK** and establishing the date of commencement of the **WORK**.

GC-1.16 **OWNER** – a public or quasi-public body or authority, corporation, association, partnership, or individual for whom the **WORK** is to be performed.

GC-1.17 **PROJECT** – The undertaking to be performed as provided in the **CONTRACT DOCUMENTS**.

GC-1.18 **RESIDENT PROJECT REPRESENTATIVE** – The authorized representative of the **OWNER** who is assigned to the **PROJECT** site or any part thereof.

GC-1.19 **SHOP DRAWINGS** – All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the **CONTRACTOR**, a **SUBCONTRACTOR**, manufacturer, **SUPPLIER** or distributor, which illustrate how specific portions of the **WORK** shall be fabricated or installed.

GC-1.20 **SPECIFICATIONS** – A part of the **CONTRACT DOCUMENTS** consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

GC-1.21 **SUBCONTRACTOR** – An individual, firm or corporation having a direct contract with the **CONTRACTOR** or with any other **SUBCONTRACTOR** for the performance of a part of the **WORK** at the site.

GC-1.22 **SUBSTANTIAL COMPLETION** – That date as certified by the **ENGINEER** when the construction of the **PROJECT** or a specified part thereof is sufficiently completed, in accordance with the **CONTRACT DOCUMENTS**, so that the **PROJECT** or specified part can be utilized for the purposes for which it is intended.

GC-1.23 **SUPPLEMENTAL GENERAL CONDITIONS** – Modifications to General Conditions required by a Federal agency for participation in the **PROJECT** and approved by the agency in writing prior to inclusion in the **CONTRACT DOCUMENTS**.

GC-1.24 **SUPPLIERS** – Any person, supplier or organization who supplies materials or equipment for the **WORK**, including that fabricated to a special design, but who does not perform labor at the site.

GC-1.25 **WORK** – All labor necessary to produce the construction required by the **CONTRACT DOCUMENTS**, and all materials and equipment incorporated or to be incorporated in the **PROJECT**.

GC-1.26 **WRITTEN NOTICE** – Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last

given address, or delivered in person to said party or his authorized representative on the **WORK**.

ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS GC-2.01 Thru 2.02

GC-2 **ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS**

GC-2.01 The **CONTRACTOR** may furnish additional instructions and detailed drawings, by the **ENGINEER**, as necessary to carry out the **WORK** required by the **CONTRACT DOCUMENTS**.

GC-2.02 The additional drawings and instruction thus supplied will become a part of the **CONTRACT DOCUMENTS**. The **CONTRACTOR** shall carry out the **WORK** in accordance with the additional detailed drawings and instructions.

SCHEDULES, REPORTS AND RECORDS GC-3.01 Thru 3.03

GC-3 **SCHEDULES, REPORTS AND RECORDS**

GC-3.01 The **CONTRACTOR** shall submit to the **OWNER** such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and data as the **OWNER** may request concerning **WORK** performed or to be performed.

GC-3.02 Prior to the first partial payment estimate the **CONTRACTOR** shall submit schedules showing the order in which he proposes to carry on the **WORK**, including dates at which he will start the various parts of the **WORK**, estimated date of completion of each part and, as applicable:

GC-3.02.1 the dates at which special detail drawings will be required; and

GC-3.02.2 respective dates for submission of **SHOP DRAWINGS**, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

GC-3.03 The **CONTRACTOR** shall also submit a schedule of payments that he anticipates he will earn during the course or the **WORK**.

DRAWINGS AND SPECIFICATIONS GC-4.01 Thru 4.03

GC-4 **DRAWINGS AND SPECIFICATIONS**

GC-4.01 The intent of the **DRAWINGS** and **SPECIFICATIONS** is that the **CONTRACTOR** shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the **WORK** in accordance with the **CONTRACT DOCUMENTS** and all incidental work necessary to complete the **PROJECT** in an acceptable manner, ready for use, occupancy or operation by the **OWNER**.

GC-4.02 In case of conflict between the **DRAWINGS** and **SPECIFICATIONS** the **SPECIFICATIONS** shall govern. Figure dimensions on **DRAWINGS** shall govern over scale dimensions, and detailed **DRAWINGS** shall govern over general **DRAWINGS**.

GC-4.03 Any discrepancies found between the **DRAWINGS** and **SPECIFICATIONS** and site conditions or any inconsistencies or ambiguities in the **DRAWINGS** and **SPECIFICATIONS** shall be immediately reported to the **ENGINEER**, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. **WORK** done by the **CONTRACTOR** after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the **CONTRACTOR'S** risk.

SHOP DRAWINGS GC-5.01 Thru 5.03

GC-5 **SHOP DRAWINGS**

GC-5.01 The **CONTRACTOR** shall provide **SHOP DRAWINGS** as may be necessary for the prosecution of the **WORK** as required by the **CONTRACT DOCUMENTS.** The **ENGINEER** shall promptly review all **SHOP DRAWINGS**. The **ENGINEER'S** approval of any **SHOP DRAWING** shall not release the **CONTRACTOR** from responsibility for deviations from the **CONTRACT DOCUMENTS**. The approval of any **SHOP DRAWINGS,** which substantially deviates from the requirement of the **CONTRACT DOCUMENTS,** shall be evidenced by a **CHANGE ORDER**.

GC-5.02 When submitted for the **ENGINEER'S** review, **SHOP DRAWINGS** shall bear the **CONTRACTOR'S** certification that he has reviewed, checked and approved the **SHOP DRAWINGS** and that they are in conformance with the requirements of the **CONTRACT DOCUMENTS**.

GC-5.03 Portions of the **WORK** requiring a **SHOP DRAWING** or sample submission shall not begin until the **SHOP DRAWING** or submission has been approved by the **ENGINEER**. A copy of each approved **SHOP DRAWING** and each approved sample shall be kept in good order by the **CONTRACTOR** at the site and shall be available to the **ENGINEER**.

MATERIALS, SERVICES, AND FACILITIES GC-6.01 Thru 6.05

GC-6 **MATERIALS, SERVICES, AND FACILITIES**

GC-6.01 It is understood that, except as otherwise specifically stated in the **CONTRACT DOCUMENTS**, the **CONTRACTOR** shall provide and pay for the materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the **WORK** within the specified time.

GC-6.02 Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the **WORK**. Stored materials and equipment to be incorporated in the **WORK** shall be located so as to facilitate prompt inspection.

GC-6.03 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

GC-6.04 Materials, supplies and equipment shall be in accordance with samples submitted by the **CONTRACTOR** and approved by the **ENGINEER**.

GC-6.05 Materials, supplies or equipment to be incorporated into the **WORK** shall not be purchased by the **CONTRACTOR** or the **SUBCONTRACTOR** subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

INSPECTIONS AND TESTING GC-7.01 Thru 7.07

GC-7 **INSPECTIONS AND TESTING**

GC-7.01 All materials and equipment used in the construction of the **PROJECT** shall be subject to adequate inspection and testing in accordance with generally accepted standards.

GC-7.02 The **CONTRACTOR** shall provide at his expense the necessary testing and inspection services required by the **CONTRACT DOCUMENTS**, unless otherwise provided.

GC-7.03 The **OWNER** shall provide all other inspection and testing services not required by the **CONTRACT DOCUMENTS**.

GC-7.04 If the **CONTRACT DOCUMENTS**, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any **WORK** to specifically be inspected, tested, or approved by someone other than the **CONTRACTOR**, the **CONTRACTOR** will give the **ENGINEER** timely notice of readiness. The **CONTRACTOR** will then furnish the **ENGINEER** the required certificates of inspection, testing or approval.

GC-7.05 Neither observations by the **ENGINEER** nor inspections, tests or approvals by persons other than the **CONTRACTOR** shall relieve the **CONTRACTOR** from his obligations to perform the **WORK** in accordance with the requirements of the **CONTRACT DOCUMENTS**.

GC-7.06 The **ENGINEER** and his representatives will at all times have access to the **WORK**. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect the work, materials, payroll, records of personnel, invoices of materials, and other relevant data and records. The **CONTRACTOR** will provide proper facilities for such access and observation of the **WORK** and also for any inspection, or testing thereof.

GC-7.07 If any **WORK** is covered contrary to the written request of the **ENGINEER** it must, if requested by the **ENGINEER**, be uncovered for his observation and replaced at the **CONTRACTOR'S** expense.

GC-7.08 If the **ENGINEER** considers it necessary or advisable that covered **WORK** be inspected or tested by others, the **CONTRACTOR**, at the **ENGINEER'S** request, will uncover, expose or otherwise make available for observation, inspection or testing as the **ENGINEER** may require, that portion of the **WORK** in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that

such **WORK** is defective, the **CONTRACTOR** will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such **WORK** is not found to be defective, the **CONTRACTOR** will be allowed an increase in the **CONTRACT PRICE** or an extension of the **CONTRACT TIME**, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate **CHANGE ORDER** shall be issued.

SUBSTITUTIONS **GC-8.01 Thru 8.01**

GC-8 **SUBSTITUTIONS**

GC-8.01 Whenever a material, article or piece of equipment is identified on the **DRAWINGS** or **SPECIFICATIONS** by reference to brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The **CONTRACTOR** may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the **CONTRACT DOCUMENTS** by reference to brand name or catalog number, and if, in the opinion of the **ENGINEER**, such material, article, or piece of equipment is of equal substance and function to that specified, the **ENGINEER** may approve its substitution and use by the **CONTRACTOR**. Any cost differential shall be adjusted to the **CONTRACT PRICE** and the **CONTRACT DOCUMENTS** shall be appropriately modified by **CHANGE ORDER**.

The **CONTRACTOR** warrants that if substitutes are approved, no major changes in the function or general design of the **PROJECT** will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the **CONTRACTOR** without a change in the **CONTRACT PRICE** or **CONTRACT TIME**.

PATENTS **GC-9.01 Thru 9.01**

GC-9 **PATENTS**

GC-9.01 The **CONTRACTOR** shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save **OWNER** harmless from loss on account thereof, except that the **OWNER** shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, but if the **CONTRACTOR** has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the **ENGINEER**.

SURVEYS, PERMITS, REGULATIONS **GC-10.01 Thru 10.03**

GC-10 **SURVEYS, PERMITS, REGULATIONS**

GC-10.1 The **OWNER** shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the **WORK** together with a suitable

number of benchmarks adjacent to the **WORK** as shown in the **CONTRACT DOCUMENTS**. From the information provided by the **OWNER**, unless otherwise specified in the **CONTRACT DOCUMENTS**, the **CONTRACTOR** shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

GC-10.02 The **CONTRACTOR** shall carefully preserve benchmarks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

GC-10.03 Permits and licenses of a temporary nature necessary for the prosecution of the **WORK** shall be secured and paid for by the **CONTRACTOR**. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the **OWNER**, unless otherwise specified. The **CONTRACTOR** shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the **WORK** as drawn and specified. If the **CONTRACTOR** observes that the **CONTRACT DOCUMENTS** are at variance therewith, he shall promptly notify the **ENGINEER** in writing, and any necessary changes shall be adjusted as provided in Section 13, **CHANGES IN THE WORK**.

PROTECTION OF WORK, PROPERTY AND PERSONS GC-11.01 Thru 11.03

GC-11 **PROTECTION OF WORK, PROPERTY AND PERSONS**

GC-11.01 The **CONTRACTOR** will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the **WORK**. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the **WORK** and other persons who may be affected thereby, all the **WORK** and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the courses of construction.

GC-11.02 The **CONTRACTOR** will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the **WORK**, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the **WORK** may affect them. The **CONTRACTOR** will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the **CONTRACTOR**, any **SUBCONTRACTOR** or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except damage or loss attributable to the fault of the **CONTRACT DOCUMENTS** or to the acts or omissions of the **OWNER** or the **ENGINEER** or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the **CONTRACTOR**.

GC-11.03 In emergencies affecting the safety of persons or the **WORK** or property at the

site or adjacent thereto, the **CONTRACTOR**, without special instruction or authorization from the **ENGINEER** or **OWNER**, shall act to prevent threatened damage, injury or loss. He will give the **ENGINEER** prompt **WRITTEN NOTICE** of any significant changes in the **WORK** or deviations from the **CONTRACT DOCUMENTS** caused thereby, and a **CHANGE ORDER** shall thereupon be issued covering the changes and deviations involved.

SUPERVISION BY CONTRACTOR GC-12.01 Thru 13.01

GC-12 **SUPERVISION BY CONTRACTOR**

GC-12.01 The **CONTRACTOR** will supervise and direct the **WORK**. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The **CONTRACTOR** will employ and maintain on the **WORK** a qualified supervisor or superintendent who shall have been designated in writing by the **CONTRACTOR** as the **CONTRACTOR'S** representative at the site. The supervisor shall have full authority to act on behalf of the **CONTRACTOR** and all communications given to the supervisor shall be as binding as if given to the **CONTRACTOR**. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the **WORK**

.

CHANGES IN THE WORK GC-13.01 Thru 13.02

GC-13 **CHANGES IN THE WORK**

GC-13.01 The **OWNER** may at any time, as the need arises, order changes within the scope of the **WORK** without invalidating the Agreement. If such changes increase or decrease the amount due under the **CONTRACT DOCUMENTS**, or in the time required for performance of the **WORK**; an equitable adjustment shall be authorized by **CHANGE ORDER**.

GC-13.02 The **ENGINEER**, also, may at any time, by issuing a **FIELD ORDER**, make changes in the details of the **WORK**. The **CONTRACTOR** shall proceed with the performance of any changes in the **WORK** so ordered by the **ENGINEER** unless the **CONTRACTOR** believes that such **FIELD ORDER** entitles him to a change in **CONTRACT PRICE** or **TIME**, or both, in which event he shall give the **ENGINEER WRITTEN NOTICE** thereof within seven (7) days after the receipt of the ordered change. Thereafter the **CONTRACTOR** shall document the basis for the change in **CONTRACT PRICE** or **TIME** within thirty (30) days. The **CONTRACTOR** shall not execute such changes pending the receipt of an executed **CHANGE ORDER** or further instructions from the **OWNER**.

CHANGES IN CONTRACT PRICE GC-14.01 Thru 14.01

GC-14 **CHANGES IN CONTRACT PRICE**

GC-14.01 The **CONTRACT PRICE** may be changed only by a **CHANGE ORDER**. The value of any **WORK** covered by a **CHANGE ORDER** or of any claim for increase or decrease in the **CONTRACT PRICE** shall be determined by one or more of the following methods in the order of precedence listed below:

(a) Unit prices previously approved.
(b) An agreed lump sum.
(c) The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the work. In addition there shall be added an amount to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of the **WORK** to cover the cost of general overhead and profit.

TIME FOR COMPLETION AND LIQUIDATED DAMAGES GC-15.01 Thru 15.4.2

GC-15 **TIME FOR COMPLETION AND LIQUIDATED DAMAGES**

GC-15.01 The date of beginning and the time for completion of the **WORK** are essential conditions of the **CONTRACT DOCUMENTS** and the **WORK** embraced shall be commenced and a date specified in the **NOTICE TO PROCEED**.

GC-15.02 The **CONTRACTOR** will proceed with the **WORK** at such rate of progress to insure full completion within the **CONTRACT TIME**. It is expressly understood and agreed, by and between the **CONTRACTOR** and the **OWNER**, that the **CONTRACT TIME** for the completion of the **WORK** described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the **WORK**.

GC-15.03 If the **CONTRACTOR** shall fail to complete the **WORK** within the **CONTRACT TIME**, or extension of time granted by the **OWNER**, then the **CONTRACTOR** will pay to the **OWNER** the amount of liquidated damages as specified in the **BID** for each calendar day that the **CONTRACTOR** shall be in default after the time stipulated in the **CONTRACT DOCUMENTS**.

GC-15.04 The **CONTRACTOR** shall not be charged with liquidated damages or any excess cost when the delay in completion of the **WORK** is due to the following, and the **CONTRACTOR** has promptly given **WRITTEN NOTICE** of such delay to the **OWNER** or **ENGINEER**.

15.04.1 To any preference, priority or allocation order duly issued by the **OWNER**.

15.04.2 To unforeseeable causes beyond the control and without the fault or negligence of the **CONTRACTOR**, including but not restricted to, acts of God, or of the public enemy, acts of the **OWNER**, acts of another **CONTRACTOR** in the performance of a contract with the **OWNER**, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, abnormal and unforeseeable weather, and for any delays of **SUBCONTRACTORS** occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

CORRECTION OF WORK GC-16.01 Thru 16.02

GC-16 **CORRECTION OF WORK**

GC-16.01 The **CONTRACTOR** shall promptly remove from the premises all **WORK**

rejected by the **ENGINEER** for failure to comply with the **CONTRACT DOCUMENTS**, whether incorporated in the construction or not, and the **CONTRACTOR** shall promptly replace and re-execute the **WORK** in accordance with the **CONTRACT DOCUMENTS** and without expense to the **OWNER** and shall bear the expense of making good all **WORK** of other **CONTRACTORS** destroyed or damaged by such removal or replacement.

GC-16.02 All removal and replacement **WORK** shall be done at the **CONTRACTOR'S** expense. If the **CONTRACTOR** does not take action to remove such rejected **WORK** within ten (10) days after receipt of **WRITTEN NOTICE**, the **OWNER** may remove such **WORK** and store the materials at the expense of the **CONTRACTOR**.

SUBSURFACE CONDITIONS GC-17.01 Thru 17.02

GC-17 **SUBSURFACE CONDITIONS**

GC-17.01 The **CONTRACTOR** shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the **OWNER** by **WRITTEN NOTICE** of:

17.01.1 Subsurface or latent physical conditions at the site differing materially from those indicated in the **CONTRACT DOCUMENTS**; or

17.01.2 Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as adhering in **WORK** of the character provided for in the **CONTRACT DOCUMENTS**.

GC-17.02 The **OWNER** shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the **WORK** an equitable adjustment shall be made and the **CONTRACT DOCUMENTS** shall be modified by a **CHANGE ORDER**. Any claim of the **CONTRACTOR** for adjustment hereunder shall not be allowed unless he has given the required **WRITTEN NOTICE**; provided that the **OWNER** may, if he determined the facts so justify, consider and adjust any such claims asserted before the date of final payment.

SUSPENSION OF WORK, TERMINATION AND DELAY GC-18.01 Thru 18.02

GC-18 **SUSPENSION OF WORK, TERMINATION AND DELAY**

GC-18.01 The **OWNER** may, at any time and without cause, suspend the **WORK** or any portion thereof for a period of not more than ninety (90) days or such further time as agreed upon by the **CONTRACTOR**, by **WRITTEN NOTICE** to the **CONTRACTOR** and the **ENGINEER** which notice shall fix the date on which **WORK** shall be resumed. The **CONTRACTOR** will resume that **WORK** on the date so fixed. The **CONTRACTOR** will be allowed an increase in the **CONTRACT PRICE** or an extension of the **CONTRACT TIME**, or both, directly attributable to any suspension.

GC-18.02 If the **CONTRACTOR** is adjudged a bankrupt or insolvent, or if he makes a

general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the **CONTRACTOR** or for any of his property, or if he files a petition to take advantage of any debtor's act, or to recognize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payment to **SUBCONTRACTORS** or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the **WORK** or if he disregards the authority of the **ENGINEER**, or if he otherwise violates any provision of the **CONTRACT DOCUMENTS**, then the **OWNER** may, without prejudice to any other right or remedy and after giving the **CONTRACTOR** and his surety a minimum of ten (10) days from delivery of a **WRITTEN NOTICE**, terminate the services of the **CONTRACTOR** and take possession of the **PROJECT** and of all materials, equipment, tools, construction equipment and machinery thereon owned by the **CONTRACTOR** and finish the **WORK** by whatever method he may deem expedient. In such case the **CONTRACTOR** shall not be entitled to receive any further payment until the **WORK** is finished. If the unpaid balance of the **CONTRACT PRICE** exceeds the direct and indirect the **CONTRACTOR** and take possession of the **PROJECT** and all materials, equipment, tools, construction equipment and machinery thereon owned by the **CONTRACTOR**, and finish the **WORK** by whatever costs of completing the **PROJECT**, including compensation for additional professional services, such excess shall be paid to the **CONTRACTOR**. If such costs exceed such unpaid balance, the **CONTRACTOR** will pay the difference to the **OWNER**. Such costs incurred by the **OWNER** will be determined by the **ENGINEER** and incorporated in a **CHANGE ORDER**.

GC-18.03 Where the **CONTRACTOR'S** services have been so terminated by the **OWNER**, said termination shall not affect any right of the **OWNER** against the **CONTRACTOR** then existing or which may thereafter accrue. Any retention or payment of monies by the **OWNER** due the **CONTRACTOR** will not release the **CONTRACTOR** from compliance with the **CONTRACT DOCUMENTS**.

GC-18.04 After ten (10) days from delivery of **WRITTEN NOTICE** to the **CONTRACTOR** and the **ENGINEER**, the **OWNER** may, without cause and without prejudice to any other right or remedy, elect to abandon the **PROJECT** and terminate the Contract. In such case, the **CONTRACTOR** shall be paid for all **WORK** executed and any expense sustained plus reasonable profit.

GC-18.05 If, through no act or fault of the **CONTRACTOR**, the **WORK** is suspended for a period of more than ninety (90) days by the **OWNER** or under an order of court or other public authority, or the **ENGINEER** fails to act on any request for payment within thirty (30) days after it is submitted, or the **OWNER** fails to pay the **CONTRACTOR** substantially the sum approved by the **ENGINEER** or awarded by arbitrators within thirty (30) days of its approval and presentation, then the **CONTRACTOR** may, after ten (10) days from delivery of a **WRITTEN NOTICE** to the **OWNER** and the **ENGINEER**, terminate the **CONTRACT** and recover from the **OWNER** payment for all **WORK** executed and all expenses sustained. In addition and in lieu of terminating the **CONTRACT**, if the **ENGINEER** has failed to act on a request for payment or if the **OWNER** has failed to make any payment as aforesaid, the **CONTRACTOR** may upon ten (10) days notices to the **OWNER** and the **ENGINEER** stop the **WORK** until he has been paid all amounts then

due, in which event and upon resumption of the **WORK, CHANGE ORDERS** shall be issued for adjusting the **CONTRACT PRICE** or extending the **CONTRACT TIME** or both to compensate for the costs and delays attributable to the stoppage of the **WORK**.

GC-18.06 If the performance of all or any portion of the **WORK** is suspended, delayed, or interrupted as a result of a failure of the **OWNER** or **ENGINEER** to act within the time specified in the **CONTRACT DOCUMENTS**, or if no time is specified, within a reasonable time, an adjustment in the **CONTRACT PRICE** or an extension of the **CONTRACT TIME**, or both, shall be made by **CHANGE ORDER** to compensate the **CONTRACTOR** for the costs and delays necessarily caused by the failure of the **OWNER** or **ENGINEER**.

PAYMENT TO CONTRACTOR GC-19.01 Thru 19.01

GC-19 **PAYMENT TO CONTRACTOR**

GC-19.01 At least ten (10) days before each progress payments falls due (but not more often than once a month), the **CONTRACTOR** will submit to the **ENGINEER** a partial payment estimate filled out and signed by the **CONTRACTOR** covering the **WORK** performed during the period covered by the partial payment estimate and supported by such data as the **ENGINEER** may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the **WORK** but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the **OWNER**, as will establish the **OWNER'S** title to the material and equipment and protect his interest therein, including applicable insurance. The **ENGINEER** will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present partial payment estimate to the **OWNER**, or return the partial payment estimate to the **CONTRACTOR** indicating in writing his reasons to approve payment. In the latter case, the **CONTRACTOR** may make the necessary corrections and resubmit the partial payment estimate. The **OWNER** will within fifteen (15) days of presentation to him of an approved partial payment estimate, pay the **CONTRACTOR** a progress payment on the basis of the approved partial payment estimate less the retainage. The retainage shall be an amount equal to ten percent (10%) of said estimate until fifty percent (50%) of the **WORK** has been completed.

At fifty percent (50%) completion, further partial payments shall be made in full to the **CONTRACTOR** and no additional amounts may be retained unless the **ENGINEER** certifies that the job is not proceeding satisfactorily, but amounts previously retained shall not be paid to the **CONTRACTOR**. At fifty percent (50%) completion or any time thereafter when the progress of the **WORK** is not satisfactory additional amounts may be retained but in no event shall the total retainage be more than ten percent (10%) of the value of the **WORK** completed. Upon substantial completion of the **WORK**, any amount retained may be paid to the **CONTRACTOR**. When the **WORK** has been substantially completed except for work which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgment of the **OWNER** are valid reasons for non-completion, the **OWNER** may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the

WORK still to be completed.

GC-19.02 The request for payment may also include an allowance for the cost of such major materials and equipment, which are suitably stored either at or near the site.

GC-19.03 Prior to **SUBSTANTIAL COMPLETION**, the **OWNER**, with the approval of the **ENGINEER** and with the concurrence of the **CONTRACTOR**, may use any completed or substantially completed portions of the **WORK**. Such use shall not constitute an acceptance of such portions of the **WORK**.

GC-19.04 The **OWNER** shall have the right to enter the premises for the purpose of doing work not covered by the **CONTRACT DOCUMENTS**. This provision shall not be construed as relieving the **CONTRACTOR** of the sole responsibility for the care and protection of the **WORK**, or the restoration of any damaged **WORK** except such as may be caused by agents or employees of the **OWNER**.

GC-19.05 Upon completion and acceptance of the **WORK**, the **ENGINEER** shall issue a certificate attached to the final payment request that the **WORK** has been accepted by him under the conditions of the **CONTRACT DOCUMENTS**. The entire balance found to be due the **CONTRACTOR**, including the retained percentages, but except such sums as may be lawfully retained by the **OWNER** shall be paid to the **CONTRACTOR** within thirty (30) days of completion and acceptance of the **WORK**.

GC-19.06 The **CONTRACTOR** will indemnify and save the **OWNER** or the **OWNER'S** agents harmless from all claims growing out of the lawful demand of **SUBCONTRACTORS**, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the **WORK**. The **CONTRACTOR** shall, at the **OWNER'S** request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the **CONTRACTOR**, fails to do so the **OWNER** may, after having notified the **CONTRACTOR**, either pay unpaid bills or withhold from the **CONTRACTOR'S** unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the **CONTRACTOR** shall be resumed in accordance with the terms of the **CONTRACT DOCUMENTS**, but in no event shall the provisions of this sentence be construed to impose any obligations upon the **OWNER** to either the **CONTRACTOR**, his Surety, or any third party. In paying any unpaid bills of the **CONTRACTOR**, any payment so made by the **OWNER** shall be considered as a payment made under the **CONTRACT DOCUMENTS** by the **OWNER** to the **CONTRACTOR** and the **OWNER** shall not be liable to the **CONTRACTOR** for any such payment made in good faith.

GC-19.07 If the **OWNER** fails to make payment thirty (30) days after approval by the **ENGINEER**, in addition to other remedies available to the **CONTRACTOR**, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the **CONTRACTOR**.

GC-20 **ACCEPTANCE OF FINAL PAYMENT AS RELEASE**

GC-20.01 The acceptance by the **CONTRACTOR** of final payment shall be and shall operate as a release to the **OWNER** of all claims and all liability to the **CONTRACTOR** other than claims in stated amounts as may be specifically excepted by the **CONTRACTOR** for all things done or furnished in connection with this **WORK** and for every act and neglect of the **OWNER** and others relating to or arising out of this **WORK**. Any payment, however, final or otherwise, shall not release the **CONTRACTOR** or his sureties from any obligations under the **CONTRACT DOCUMENTS** or the Performance Bond and Payment Bonds.

GC-21 **INSURANCE**

GC-21.01 The **CONTRACTOR** shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the **CONTRACTOR'S** executions of the **WORK**, whether such execution be by himself or by any **SUBCONTRACT** or by anyone directly employed by any of them, or by anyone for whose acts any of them may be liable.

21.01.1 Claims under workmen's compensation, disability benefit and other similar employee benefit acts;

21.01.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

21.01.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

21.01.4 Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the **CONTRACTOR**, or (2) by any other person; and

21.01.5 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting there from.

GC-21.02 Certificates of Insurance acceptable to the **OWNER** shall be filed with the **OWNER** prior to commencement of the **WORK**. These Certificates shall contain a provision that coverage(s) afforded under the policies will not be canceled unless at least fifteen (15) days prior **WRITTEN NOTICE** has been given to the **OWNER**.

GC-21.03 The **CONTRACTOR** shall procure and maintain, at his own expense, during the **CONTRACT TIME**, liability insurance as hereinafter specified;

21.03.1 **CONTRACTOR'S** General Public Liability and Property Damage

Insurance including vehicle coverage issued to the **CONTRACTOR** and protecting him from all claims for personal injury, including death, and all claims for destruction of our damage to property, arising out of or in connection with any operations under the **CONTRACT DOCUMENTS**, whether such operations be by himself or by any **SUBCONTRACTOR** under him, or anyone directly or indirectly employed by the **CONTRACTOR** or by a **SUBCONTRACTOR** under him. Insurance shall be written with the following limits of liability:

General Aggregate	$2,000,000
Products/Completed Operations Aggregate	$2,000,000
Per Occurrence	$2,000,000
Fire Legal Liability	$500,000
Medical Payments	$5,000

21.03.2 The **CONTRACTOR** shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the **PROJECT** to the full insurable value thereof for the benefit of the **OWNER**, the **CONTRACTOR**, and **SUBCONTRACTORS** as their interest may appear. This provision shall in no way release the **CONTRACTOR** or **CONTRACTOR'S** surety from obligations under the **CONTRACT DOCUMENTS** to fully complete the **PROJECT**.

GC-21.04 The **CONTRACTOR** shall procure and maintain, at his own expense, during the **CONTRACT TIME**, in accordance with the provisions of the laws of the state in which the work is performed, Workmen's Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the **PROJECT** and in case any work is sublet, the **CONTRACTOR** shall require such **SUBCONTRACTOR** similarly to provide Workman's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the **CONTRACTOR**. In case any class of employees engaged in hazardous work under this contract at the site of the **PROJECT** is not protected under Workmen's Compensation statute, the **CONTRACTOR** shall provide, and shall cause each **SUBCONTRACTOR** to provide, adequate and suitable insurance for the protection of his employees not otherwise protected.

GC-21.05 The **CONTRACTOR** shall secure, if applicable, "All Risk" type Builders Risk Insurance for **WORK** to be performed. Unless specifically authorized by the **OWNER**, the amount of such insurance shall not be less than the **CONTRACT PRICE** totaled in the bid. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, win, collapse, riot, aircraft, and smoke during the **CONTRACT TIME**, and until the **WORK** is accepted by the **OWNER**. The policy shall name as the insured the **CONTRACTOR**, the **ENGINEER**, and the **OWNER**.

CONTRACT SECURITY **GC-22.01 Thru 22.01**

GC-22 **CONTRACT SECURITY**

GC-22.01 The **CONTRACTOR** shall within ten (10) days after the receipt of the **NOTICE**

OF AWARD furnish the **OWNER** with a Performance Bond and a Payment Bond in the penal sums equal to the amount of the **CONTRACT PRICE**, conditioned upon the performance by the **CONTRACTOR** of all undertakings, covenants, terms, conditions and agreements of the **CONTRACT DOCUMENTS**, and upon the prompt payment by the **CONTRACTOR** to all persons supplying labor and materials in the prosecution of the **WORK** provided by the **CONTRACT DOCUMENTS**. Such **BONDS** shall be executed by the **CONTRACTOR** and a corporate bonding company licensed to transact such business in the state in which the **WORK** is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these **BONDS** shall be borne by the **CONTRACTOR**. If at any time a surety on any such **BOND** is declared bankrupt or loses its right to do business in the state in which the **WORK** is to be performed or is removed from the list of Surety Companies accepted on Federal **BONDS, CONTRACTOR** shall within ten (10) days after notice from the **OWNER** to do so, substitute an acceptable **BOND** (or **BONDS**) in such form and sum and signed by such other surety or sureties as may be satisfactory to the **OWNER**. The premiums on such **BOND** shall be paid by the **CONTRACTOR**. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable **BOND** to the **OWNER**.

ASSIGNMENTS **GC-23.01 Thru 23.01**

GC-23 **ASSIGNMENTS**

GC-23.01 Neither the **CONTRACTOR** nor the **OWNER** shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title or interest therein, or his obligations hereunder, without written consent of the other party.

INDEMNIFICATION **GC-24.01 Thru 24.03**

GC-24 **INDEMNIFICATION**

GC-24.01 The **CONTRACTOR** will indemnify and hold harmless the **OWNER** and the **ENGINEER** and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the **WORK**, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property, including the loss of use resulting there from; and is caused in whole or in part by any negligent or willful act or omission of the **CONTRACTOR**, and **SUBCONTRACTOR**, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

GC-24.02 In any and all claims against the **OWNER** or the **ENGINEER**, or any of their agents or employees, by any employee of the **CONTRACTOR**, and **SUBCONTRACTOR**, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the **CONTRACTOR** or any

SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

GC-24.03 The obligation of the **CONTRACTOR** under this paragraph shall not extend to the liability of the **ENGINEER**, his agents or employees arising out of the preparation or approval of maps, **DRAWINGS**, opinions, reports, surveys, **CHANGE ORDERS**, designs or **SPECIFICATIONS**.

SEPARATE CONTRACTS **GC-25.01 Thru 25.03**

GC-25 **SEPARATE CONTRACTS**

GC-25.01 The **OWNER** reserves the right to let other contracts in connection with this **PROJECT.** The **CONTRACTOR** shall afford other **CONTRACTORS** reasonable opportunity for the introduction and storage of their materials and the execution of their **WORK**, and shall properly connect and coordinate his **WORK** with theirs. If the proper execution or results of any part of the **CONTRACTOR'S WORK** depends upon the **WORK** of any other **CONTRACTOR**, the **CONTRACTOR** shall inspect and promptly report to the **ENGINEER** any defects in such **WORK** that render it unsuitable for such proper execution and results.

GC-25.02 The **OWNER** may perform additional **WORK** related to the **PROJECT** by himself, or he may let other contracts containing provisions similar to these. The **CONTRACTOR** will afford the other **CONTRACTORS** who are parties to such Contracts (or the **OWNER**, if he is performing the additional **WORK** himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of **WORK**, and shall properly connect and coordinate his **WORK** with theirs.

GC-25.03 If the performance of additional **WORK** by other **CONTRACTORS** or the **OWNER** is not noted in the **CONTRACT DOCUMENTS** prior to the execution of the **CONTRACT**, written notice thereof shall be given to the **CONTRACTOR** prior to starting any such additional **WORK**. If the **CONTRACTOR** believes that the performance of such additional **WORK** by the **OWNER** or others involves him in additional expense or entitles him to an extension of the **CONTRACT TIME**, he may make a claim thereof as provided in Sections 14 and 15.

SUBCONTRACTING **GC-26.01 Thru 26.05**

GC-26 **SUBCONTRACTING**

GC-26.01 The **CONTRACTOR** may utilize the services of specialty **SUBCONTRACTORS** on those parts of the **WORK** which, under normal contracting practices, are performed by specialty **CONTRACTORS**.

GC-26.02 The **CONTRACTOR** shall not award **WORK** to **SUBCONTRACTOR(S)**, in excess of fifty percent (50%) of the **CONTRACT PRICE**, without prior written approval of the **OWNER**.

GC-26.03 The **CONTRACTOR** shall be fully responsible to the **OWNER** for the acts and omissions of his **SUBCONTRACTORS**, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons

directly employed by him.

GC-26.04 The **CONTRACTOR** shall cause appropriate provisions to be inserted in all subcontracts relative to the **WORK** to bind **SUBCONTRACTORS** to the **CONTRACTOR** by the terms of the **CONTRACT DOCUMENTS** insofar as applicable to the **WORK** of **SUBCONTRACTORS** and to give the **CONTRACTOR** the same power as regards terminating any subcontract that the **OWNER** may exercise over the **CONTRACTOR** under any provision of the **CONTRACT DOCUMENTS**.

GC-26.05 Nothing contained in this **CONTRACT** shall create any contractual relation between any **SUBCONTRACTOR** and the **OWNER**.

ENGINEERING AUTHORITY GC-27.01 Thru 27.04

GC-27 **ENGINEERS AUTHORITY**

GC-27.01 The **ENGINEER** shall act as the **OWNER'S** representative during the construction period. He shall decide questions, which may arise as to quality and acceptability of materials furnished and **WORK** performed. He shall interpret the intent of the **CONTRACT DOCUMENTS** in a fair and unbiased manner. The **ENGINEER** will make visits to the site and determine if the **WORK** is proceeding in accordance with the **CONTRACT DOCUMENTS**.

GC-27.02 The **CONTRACTOR** will be held strictly to the intent of the **CONTRACT DOCUMENTS** in regard to the quality of materials, workmanship and execution of the **WORK**. Inspections may be made at the factory or fabrication plant of the source of material supply.

GC-27.03 The **ENGINEER** will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

GC-27.04 The **ENGINEER** shall promptly make decisions relative to interpretation of the **CONTRACT DOCUMENTS**.

LAND AND RIGHTS-OF-WAY GC-28.01 Thru 28.03

GC-28 **LAND AND RIGHTS-OF-WAY**

GC-28.01 Prior to issuance of **NOTICE TO PROCEED**, the **OWNER** shall obtain all land and rights-of-way necessary for carrying out and for the completion of the **WORK** to be performed pursuant to the **CONTRACT DOCUMENTS**, unless otherwise mutually agreed.

GC-28.02 The **OWNER** shall provide to the **CONTRACTOR** information, which delineates and describes the lands owned and right-of-way acquired.

GC-28.03 The **CONTRACTOR** shall provide at his own expense and without liability to the **OWNER** any additional land and access thereto that the **CONTRACTOR** may desire for temporary construction facilities, or for storage of materials.

GC-29 **GUARANTY**

GC-29.01 The **CONTRACTOR** shall guarantee all materials and equipment furnished and **WORK** performed for a period of one (1) year from the date of **SUBSTANTIAL COMPLETION**. The **CONTRACTOR** warrants and guarantees for a period of one (1) year from the date of **SUBSTANTIAL COMPLETION** of the system that the completed system is free from all defects due to fault materials or workmanship and the **CONTRACTOR** shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The **OWNER** will give notice of observed defects with reasonable promptness. In the event that the **CONTRACTOR** should fail to make such repairs, adjustments, or other **WORK** that may be made necessary by such defects, the **OWNER** may do so and charge the **CONTRACTOR** the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

GC-30 **TAXES**

GC-30.01 The **CONTRACTOR** will pay all sales, consumer, use and other similar taxes required by the law of the place where the **WORK** is performed.

SPECIAL CONDITIONS

1. **QUALIFICATIONS OF BIDDER**

The apparent low bidder shall submit to the **OWNER** a list and description of work performed on previous projects similar to this along with evidence of financial ability, including a list of equipment owned, to satisfactorily complete the project, if requested by the **OWNER**.

2. **SUBCONTRACTORS AND SUPPLIERS**

In accordance with paragraph GC-26 of the **General Conditions** the **CONTRACTOR** shall submit a list of any Subcontractors and major material suppliers proposed on this project.

3. **CONTRACT SECURITY**

Contract Security shall be provided as set out in the **Information for Bidders** and in accordance with paragraph GC-22 of the **General Conditions**.

4. **CONTRACTOR AND SUBCONTRACTOR'S PUBLIC LIABILITY, AUTOMOBILE LIABILITY AND PROPERTY DAMAGE INSURANCE**

With reference to Section GC-21 of the **General Conditions**, the **CONTRACTOR** is advised that he shall purchase and maintain at his own expense Property Insurance as will protect the **CONTRACTOR** and the **OWNER** from loss or damage while the project is under construction and prior to full acceptance thereof by the **OWNER**.

5. **ESTIMATE FOR PARTIAL PAYMENT**

Form FHA 424-18 "**Partial Payment Estimate**", shall be used when estimating periodic payment due the **CONTRACTOR**. The applications for progress or final payments by the **CONTRACTOR** will be submitted to the **ENGINEER** on or before the 5th day of each calendar month. The date at which receipt of partial payment by **ENGINEER** as stipulated in **General Conditions** (GC-19) is hereby set as the 5th day of the month provided estimates are received by such time. The partial payment estimate shall be for work performed no later than the last day of the preceding calendar month.

6. **CONTRACTOR - WITHDRAWAL OF RETAINED FUNDS**

The **GENERAL CONTRACTOR**, subcontractor and material suppliers waive all rights to withdrawal of retained funds, which may accrue under Tennessee Code Annotated 12-434.

TECHNICAL SPECIFICATIONS

WATER LINE ADDITIONS

SECTION 1 - SCOPE OF PROJECT

1.0 **GENERAL** -The purpose of the requirements and guidelines is to provide guidance to the Developers, engineers, and contractors in order to achieve an acceptable installation for furnishing of water system components to subdivisions and other developments. The work to be accomplished under these Specifications consists of the furnishing of all materials, machinery, labor, equipment and services necessary for the construction of water line addition more particularly described elsewhere in the Specifications and shown on the Plans. Summarized below are requirements and conditions that apply to the granting of water service by the Town of Smyrna.

The **CONTRACTOR** shall perform all necessary clearing, staking, excavating, backfilling, grading, clean-up, restoration of damage to property, testing, etc., for the proper and complete installation of the system and restoration of the surface to its original condition.

1.1 Prior to the design of any water line extension, component, or expansion, the design engineer should first confer with the Town's Planning Department with regard to growth potential and density that may be expected in the general area of the extension being planned. A conference with the Director of Utilities should follow to discuss system standards and requirements, as well as any issues related to the water system components being proposed.

1.1.1. Construction of water system components and water lines (including individual service connections) may not begin until approval by the Town of Smyrna and the Tennessee Department of Environment and Conservation, Department of Water Supply has been received.

1.2 No connection to an existing water line shall be made until all new lines have been completely installed, tie-in(s) completed, tested and accepted by the Director of Utilities.

1.3 The Town of Smyrna will not accept utility lines that were not approved in accordance with these specifications.

1.4 Service connection and service line construction to property line or right-of-way (only) is covered herein. Service line constructed from property line or right-of-way to structure is covered in the latest edition of the Standard Plumbing Code.

1.5 Water service may be denied to structures currently connected to the Town's Sewer System which is deemed to be outside of the Town's Water Service District.

1.6 All water lines and services (to property line or right-of-way only) constructed utilizing these specifications become the property of the Town of Smyrna upon acceptance by the Director of Utilities. Utility lines and services (to property line or right-of-way only) will not be accepted by the Town unless and until they are in strict conformance with these specifications.

1.7 Two (2) sets of plans and specifications, including a vicinity map, shall be submitted for the initial review. All construction plans submitted will include at minimum all calculations, plan and profiles, details, scale, appropriate plan notes, and general notes. If the plans are in order,

with no major changes, the Developer or his Engineer will submit the number of additional sets of plans needed for the project for approval.

1.8 Five (5) sets of drawings including vicinity map, one (1) electronic set and hydraulic calculations shall be submitted for approval. Submittals shall be presented based on the Town's Planning and Utility Departments submittal schedules. Developers and their engineers are asked to submit drawings as far in advance as possible in order to conserve time at planning and utility meetings. After approval, four (4) sets of drawings for each utility shall be submitted to the Tennessee Department of Environment and Conservation for their approval. Approval of the plans and specifications by the Tennessee Department of Environment and Conservation, Tennessee Department of Transportation, Railroads, Corps of Engineers, Tennessee Valley Authority, and any other agency having jurisdiction is required before beginning construction. One (1) set of TDEC approved drawings and one (1) copy of the State approval letter shall be provided to the Director of Utilities prior to beginning construction. Prior to beginning of construction, a pre-construction meeting will be held at Smyrna Utilities' office. Prior to acceptance of the water system components by the Town, two sets of paper "Record Drawings" along with digital drawings (compatible with the Town of Smyrna's Utilities Department software) showing all work, changes, elevations, fittings, line locations, service locations, and other data required for complete "Record Drawings" shall be submitted to the Director of Utilities after each project or phase of a project is completed. The "Record Drawings" shall be reviewed by the Utilities Department and may require additional information prior to acceptance of the water system components.

1.9 Detailed drawings and specifications shall be submitted by the Engineer employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and approved by the Director of Utilities before beginning any construction.

1.10 All applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply throughout the design, approval, and construction process.

1.11 Sizes and locations of all water lines, components, appurtenances, and construction methods shall be in accordance with these Standard Specifications and plans approved by the Town. If plans are approved by the Town and they are later found not to be in compliance with these standard specifications or other requirements (as deemed necessary by the Director of Utilities) then they shall be revised to such standards required and shall be constructed accordingly prior to acceptance by the Town. All water lines shall be sized in accordance with current 2012 International Fire Code.

1.12 Permits for pavement cuts or crossing of public roads, including any special backfill and pavement repair as required by the agency having jurisdiction, are the responsibility of the Developer. A bond is required from the Developer to cover all costs of repair and maintenance for a period of one (1) year from the date of acceptance of the project for all work performed in existing rights-of-way of all roads. Open road cuts will not be allowed unless approval has been granted by both the Director of Utilities and the Department of Public Works.

1.13 If construction has not started within one (1) year from the date of approval then that approval will no longer be valid. Utility plans shall be resubmitted to renew approval. Renewal will not be automatically guaranteed, but will be based on current review and existing conditions.

1.14 The Contractor's name, project name, project location, and estimated working time for each project shall be submitted to the Director of Utilities prior to construction with the plans submitted for review and approval.

1.15 Laboratory test reports shall be provided on all water line piping to assure that it meets the requirements of the Town's specifications.

1.16 Shop drawings for utility materials shall be submitted to the Director of Utilities for review after being thoroughly checked by the Contractor and stamped with his approval.

1.17 The Town reserves the right to require relocation of water lines on the construction plans to facilitate maintenance.

1.18 All utility construction shall be in accordance with specifications of the Town of Smyrna.

1.19 All grading work shall be completed, all roads and areas of proposed water main shall be constructed to subgrade, and lot corners are to be marked prior to the installation of utility lines.

1.20 The contractor shall be responsible for locating and verifying the elevations of existing utilities prior to construction.

1.21 A one-(1) year warranty period will begin upon the date of acceptance of the project by the Town.

1.22 Any special requirements shall be transmitted as a part of the approval.

1.23 All plans shall be stamped by a Tennessee Licensed Professional Engineer.

2. **Initial Plan Submittals**: The plans must be submitted at least twenty-one (21) days prior to the date on which action is desired. The initial submittal should include, but not be limited to the following:

2.1 Two (2) copies of the proposed water system improvements complete construction plans in addition to all sets required by the Planning Department.

2.2 Complete project specifications in accordance with these Standard Specifications.

2.3 Engineering reports including design criteria and calculations used in sizing mains, and/or pumping stations.

3. **Easements**

3.1 When utility lines are constructed outside a public right-of-way, easements must be a minimum of 20 feet in width. Wider easements may be required after further review by the Director of Utilities. Easements required across private property or in roads are to be acquired by the Developer in the name of the Town.

3.2 Easements for utility line extensions may be provided in either of two (2) ways.

3.2.1 Easement Document on a form, approved by the Town, which must include legal description of the easement(s), legal owner's name and Book and Page where deed is recorded, and must be signed by the Owner, and then notarized.

3.2.2 Record with Subdivision Plat - If this method of recording easements is chosen, a preliminary plat of the subdivision must be provided at the time of plans submittal, which clearly defines the easements to be recorded, along with a letter of intent from the Licensed Engineer or Licensed Surveyor who will stamp the final subdivision plat, assuring that easements will be recorded as shown on the preliminary plat.

3.3 All easements must be obtained and recorded in developed areas before construction can begin. In new subdivisions the letter of intent and preliminary plat showing the easements will be sufficient to start construction. However, the Final Plat must be recorded prior to final acceptance of the new facilities.

3.4 Special easements such as Railroad Crossings, Corp of Engineers, Tennessee Valley Authority, and State Highway crossings must be prepared by the Developer's Engineer as described above prior to commencement of construction.

4. **Pre-Construction Meeting**

4.1 Before beginning any construction, the Developer shall contact the Town and schedule a preconstruction conference and shall pay all tap fees and impact fees as required prior to commencement of any construction. The Developer, Engineer, and the Town's Utility Representative shall attend the meeting to discuss procedures for construction, inspection, connections to existing facilities, acceptance procedure by the Town, and any other special issues that are warranted for discussion. At this meeting, the Contractor will be informed of the Town's policies and any special requirements. Listed below is a CHECKLIST of items relating to the project:

4.2 **BEFORE Pre-Construction Meeting**:

4.2.1 Developer is to coordinate meetings.

4.2.2 Developer, or his Engineer, is to have project plans approved by all agencies.

4.2.3 Developer is to have a contract with the utility contractor prior to the preconstruction meeting.

4.2.4 Contractor is to have shop drawings approved by the Town.

4.2.5 When submitting plans and shop drawings to the Town's Director of Utilities they will retain one (1) copy and the Town will retain two (2) copies. Shop drawings will not be reviewed unless they have been checked by the Contractor and stamped by him to indicate that they meet the Town's Standard Specifications.

4.2.6 Developer is to have at meeting:

- Approved plans.
- Copy of Contractor's contract (both off-site and on-site).

- Tap fees and impact fees. All fees are subject to final approval by the Town of Smyrna Director of Utilities.

4.2.7 Contractor shall provide proof of valid Contractor's License that is on file with the State of Tennessee.

4.3 **To Attend Conference:**

4.3.1 Developer.

4.3.2 Developer's Engineer.

4.3.3 Developer's Contractor.

4.3.4 Representative(s) from the Town's Utilities Department and/or the Town's project engineer.

A. GENERAL GUIDELINES FOR WATER LINES

1. No valve or cutoff shall be operated except by a Town Representative.

2. No utility plans will be reviewed until the development plans have received preliminary approval by the planning commission having jurisdiction.

3. Sizes and locations of mains, valves, fittings, plugs, and hydrants, shall be in accordance with the plans approved by the Town.

4. Detailed plans and specifications shall be submitted by the Engineer employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and shall be approved by the Town before beginning any construction.

5. "Cut-ins" or taps to live mains shall be made only in the presence of a Town Representative.

6. Meters, meter setters (5/8" x 3/4"), and Itron encoder receiver transmitters (ERT) shall be provided by the Town to the Developers for each lot after the builder pays connection fee. All water service taps, corporation stop, meter cut-off, service line; meter box will be installed by the Contractor. After installation, the water meter assembly shall be identified by four (4) foot long wooden stakes a minimum of two (2) feet around the meter box with orange ribbon wrapped around the stakes.

7. Permits for pavement cuts or crossing of public roads, including any special backfill and pavement repair as required by the agency having jurisdiction, are the responsibility of the Developer. A bond shall be provided to the Town by the Developer to cover all costs of repair and maintenance for a period of one (1) year from the date of acceptance of the project for all work performed in existing rights-of-way of the Town of Smyrna roads, Rutherford County roads, and all State Highways. The amount of this bond shall be determined by the Town after

it receives all requirements for repairs from the appropriate Town Of Smyrna Public Works Department, County Highway Department, or the Tennessee Department of Transportation.

8. Water mains are generally located within street right-of-ways of new developments. However, when special conditions require them, separate dedicated easements must be provided with a minimum width of twenty (20) feet.

9. Centerlines of roads shall be staked before beginning construction. The road section and water line location in relation to the centerline of the road shall be shown on the plans. Front-lot corners shall be marked before services are installed in order for services to be properly located.

10. Hydraulic calculations and data should be submitted for the proposed system.

11. Where the static water pressure exceeds 80 psi, the developer shall provide a pressure-reducing valve on the service line. This pressure-reducing valve shall be installed in accordance with the detail in the Standard Drawings section of this document.

12. <u>Protection of Water Supplies</u>

(a) Water Supply Interconnections: There shall be no physical connection between a potable water supply line and a sewer or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply.

(b) Relation to Water Mains:

1. Horizontal Separation: sewers are to be laid at least ten (10) feet horizontally from any existing or proposed water pipe. Should local conditions prevent a lateral separation of ten (10) feet to the water main, it is to be laid in a separate trench and if the elevation of the top of the sewer pipe is at least 18 inches below the bottom of the water pipe.

2. Vertical Separation: Whenever a sewer must cross under a water main, the sewer shall be laid at such elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirement, the water main shall be relocated to provide the separation or reconstructed with ductile iron pipe for a minimum distance of ten (10) feet on each side of the sewer. At least one (1) full length of water main should be centered over the sewer so that both joints shall be as far from the sewer as possible.

3. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and the sewer shall be constructed of ductile iron pipe and shall be pressure-tested to ensure water tightness.

13. **Minimum Distribution Pipe Size**

(a) The minimum size pipe shall be eight (8) inch diameter except six (6) inch pipe will be permitted when looped in a grid and no leg of such a grid exceeds 800 feet in length or as directed by the Director of Utilities.

(b) The size of pipe shall be justified by hydraulic analysis performed by an engineer who holds a valid license to practice in the State of Tennessee. Distribution piping shall be capable of meeting the 2018 International Fire Code.

(c) All assumptions and any flow data used by the design engineer must be clearly documented and submitted with the hydraulic calculations. If actual flow data are not available, theoretical calculations shall be based on all storage facilities being half-full and the appropriate Hazen and Williams friction factor shall be applied for the type pipe being used, but in no case shall such friction factor be greater than 120.

14. **Fire Protection**

(a) Shall be in accordance with 2018 International Fire Code. At minimum fire protection shall be 1,000 gpm at 20 psi for residential uses and 1,500 gpm at 20 psi for non-residential uses. The greater of the requirements shall be met.

(b) Fire hydrants shall be located at points to be within a maximum distance of 500-feet to any proposed residential structure and 400-feet for commercial applications.

(c) The minimum pipe size to which a fire hydrant may be connected shall be six (6) inches.

(d) The minimum standards for privately-owned sprinkler service lines shall be the following:

i. Constructed of Class 350 ductile iron pipe.

ii. A Reduced Pressure Backflow prevention device shall be installed.

iii. Reviewed and approved by the Town's Fire Department Official and by the State's Fire Marshall.

(e) The minimum standards for fire department connection (FDC) location shall be the following:

i. The FDC shall be located one & one-half (1 ½) times the height of the building away from the building if acceptable, but the minimum distance away from the building is 30 ft. The FDC cannot be installed on the building.

ii. There shall be a fire hydrant within 100 ft. from the FDC.

iii. The FDC shall have 3 ft. clearance in all directions around it.

15. Marking of Hydrants

15.1 Classifications of Hydrants

(a) Hydrants should be classified in accordance with their rated capacities at 20 psi residual pressure as follows:

Class AA – Rated capacity of 1500 gpm or greater
Class A – Rated capacity of 1000-1499 gpm
Class B – Rated capacity of 500-999 gpm
Class C – Rated capacity of less than 500
Class D – Out of Service

15.2 Public Hydrants

(a) All barrels are to be chrome yellow except in cases where another color has already been adopted.

(b) The tops and nozzle caps should be painted with the following capacity-indicating color scheme to provide simplicity and consistency with colors used in signal work for safety, danger, and intermediate condition:

(1) Class AA – Blue

(2) Class A - Green

(3) Class B - Orange

(4) Class C - Red

(5) Class D - Black

(c) For rapid identification at night, it is recommended that the capacity colors be of reflective-type paint.

(d) The classification and marking of hydrants provided for in this section anticipate determination based on individual flow test.

(e) Where a group of hydrants can be used at the time of a fire, some special marking designating group-flow capacity may be desirable.

15.3 Permanently Inoperative Hydrants
Fire hydrants that are permanently inoperative or unusable should be removed.

15.4 Temporarily Inoperative Hydrants

Fire hydrants that are temporarily inoperative or unusable shall be wrapped or otherwise provided a temporary indication of their condition.

15.5 Flush Hydrants
Location markers for flush hydrants should carry the same background color as stated above or class identification, with such other data stenciled thereon as deemed necessary.

15.6 Private Hydrants
Marking on private hydrants within private enclosures is to be at the owner's discretion. When private hydrants are located on public streets, they should be painted red to distinguish them from public hydrants.

16. **Dead Ends**

(a) Dead ends shall be minimized in water line extensions.

(b) Where dead end distribution pipes occur, they should be provided with a fire hydrant for blow off purposes (where fire protection is provided by the distribution system). Small diameter blow-off hydrants are not allowed.

(c) Dead end water lines shall extend to the property line, with a line size gate valve, cap, thrust blocking, and reverse restraint rodding.

17. **Water Valves**

(a) Unless otherwise specified by the Director of Utilities, gate valves shall be placed at all intersections of distribution pipes. Three (3) valves shall be placed at each tee; one (1) installed in the run and the other two (2) installed at the branch ends. Four (4) valves shall be placed at each cross. Valves should be positioned in the pipeline approximately three (3) feet distance from the tee or cross. Valves shall not be located in the pavement areas but shall be installed behind the extruded concrete curbing of the roadway.

(b) Valves shall be placed on lead-outs approximately three (3) feet from fire hydrants except those having lead-outs to be connected to fire hydrant type tees, in which case, the valves may be connected to such fire hydrant tee.

(c) Offsite water mains and/or transmission waterlines a valve shall be installed every 500 ft. of water main. If multiple distances of 500 ft. of water main is not met, then half the distance of the waterline run a valve shall be installed.

19. **Means of Detecting PVC pipe**

When PVC pipe is installed, for detection purposes, a 12 gage solid (braided and strand is not allowed) copper tracing wire (shielded) shall be duct taped to the water line pipe at both ends and at the middle of each segment. Connections between wires shall be soldered or connected with water tight wire nut fasteners

and wrapped. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached. An approved metallic tape identified as "water" and shall be installed as per the manufacturer's instructions. Bury the metallic tape 12 inches below the subgrade.

20. **Separation of Water Mains and Other Utilities**

(a) General:

The following factors should be considered in providing adequate separation:

1. Materials and type of joints for water and sewer pipes.

2. Soil conditions.

3. Service and branch connections into the water main and other utilities.

4. Compensating variations in the horizontal and vertical separations.

5. Space for repair and alterations of the water main with relation to the other utilities.

6. Off-setting of pipes around manholes and other structures.

7. Water mains and other utilities shall not be laid in the same trench.

(b) Parallel Installation:

1. Normal conditions-Water mains shall be laid at least ten (10) feet horizontally from other utilities. Whenever possible; the distance shall be measured edge-to-edge.

2. Unusual conditions-When local conditions prevent a horizontal separation of ten (10) feet, a water main may be laid closer to other utilities provided that:

i. The bottom of the water main is at least 18 inches above the top of other utilities.

ii. Where this vertical separation cannot be obtained, the other utilities shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to ensure water tightness prior to backfilling.

(c) Crossing:

1. Normal conditions-Water mains crossing other utilities will be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the other utilities, whenever possible.

2. Unusual conditions-When local conditions prevent a vertical separation as described hereinbefore, the following shall be used:

   i. Sewers passing over or under water mains should be constructed of ductile iron.

   ii. Water mains passing under sewer mains shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer main and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints ad settling breaking the water mains; that the length of water pipe be centered at the point of crossing so that the joints will be equidistant as far as possible from the sewer main. Both the sewer and the water main shall be constructed of the same material as the water pipe and tested in accordance with these Standards.

21. **Surface Water Crossings**

Surface water crossings, both under and over water, present special problems which should be discussed with the Town of Smyrna; the Tennessee Department of Environment and Conservation, Division of Water Supply and Division of Water Pollution Control; Tennessee Valley Authority, and the U.S. Army Corps of Engineers before the plans are prepared.

All surface water crossings shall be in accordance with the requirements of the General Permits for an Aquatic Resource Alteration Permit. (ARAP)

(a) Above Water Crossings; the pipe shall be:

1. Structurally self-supporting or with structural casing which both are adequately supported.

2. Protection from damage and freezing.

3. Accessible for repairs and replacement.

4. Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing or repairs. The valves shall be easily accessible and not subject to flooding.

(b) When Crossing Water Courses Which are Greater than 15 feet in width:

1. The pipe shall be of special construction, having flexible, watertight, restrained joint connections.

2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair, the valves shall be easily accessible and not subject to flooding;

3. Sampling taps should be available at each end of the crossing;

4. Permanent taps should be made for testing and locating leaks.

22. **Cross Connections**

(a) There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.

(b) The approval of the Tennessee Department of Environment and Conservation, Division of Water Supply, shall be obtained for the interconnections between potable and water supplies.

(c) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

23. **Water Services and Plumbing**

(a) Water services and plumbing shall conform to the currently adopted code as may be revised and adopted from time to time by the Town of Smyrna.

SECTION 2 - PRELIMINARY WORK

2.01 **GENERAL**

A. No construction shall commence until plans are approved by the Tennessee Department of Environment and Conservation and said approved plans are on site.

B. In addition, no construction shall commence until a **Notice to Proceed** letter has been received from the District.

2.02 **LOCATION AND PROTECTION OF UNDERGROUND UTILITIES** - Prior to trenching, the **CONTRACTOR** shall determine, insofar as possible, the actual location of all underground utilities in the vicinity of his operations and shall have the respective utilities clearly mark their location so that they may be avoided by equipment operators. As per Tennessee State Law, a minimum of 72 hours before excavation is to begin, the **CONTRACTOR** shall call the **Tennessee One Call System at 1-800-351-111 or 811** to have member utilities mark their utilities. Please note that non-member utilities will have to be contacted individually. Where such utility lines or services appear to lie in the path of construction they shall be uncovered in advance to determine the exact location and depth and to avoid damage due to trenching operations. Existing facilities shall be protected during construction or removed and replaced in equal condition, as necessary.

Should any existing utility line or service be damaged during or as a result of the **CONTRACTOR'S** operations, the **CONTRACTOR** shall take such emergency measures as may be necessary to minimize damage and shall immediately notify the utility involved. The **CONTRACTOR** shall then repair the damage to the satisfaction of the utility or shall pay the utility for making the repairs. In all cases, the restoration and/or repair shall be such that the damaged structure will be in as good or better condition as before the damage occurred.

2.03 **SURVEYING AND STAKING** - The plans show the desired location of the water mains and it shall be the responsibility of the **CONTRACTOR** to provide the necessary stakes and lines to insure that the water mains will be actually installed in the location shown. Graphic symbols are used to indicate valve and hydrant general locations but **ARE NOT** drawn to scale. Minor changes in pipe line location to avoid obstructions or provide better coordination with topographic conditions may be worked out in the field between representatives of the **CONTRACTOR** and the **ENGINEER**. In general such field changes shall be limited to occasional deflections to avoid side drains, culverts, ditches, or other obstructions or lateral shifts which would result in an improved laying condition or a decrease in inconvenience to property owners or motorists.

It is intended that the waterline be held a reasonable uniform distance from rights-of-way, edge of pavement, or other boundary and indiscriminate wandering over the available area solely for the purpose of selecting the easiest trenching conditions will not be tolerated.

Once the proposed location of the pipeline has been established the **CONTRACTOR** shall provide sufficient stakes and lines to guide the equipment operators and insure that the trenching will be done to proper alignment.

2.04 **REMOVAL OF OBSTRUCTIONS** - The **CONTRACTOR** shall be responsible for the removal, safeguarding and replacement of fences, walls, structures, culverts, street signs, billboards, shrubs, mailboxes, or other obstruction, which must be moved to facilitate construction. Such obstructions must be restored to at least their original condition.

2.05 **CLEARING AND GRUBBING** - The **CONTRACTOR** shall be responsible for cutting, removing and disposing of all trees, brush, stumps, roots and weeds within the construction area. Disposal shall be by means of chippers, landfills, or other approved methods not in conflict with State or local ordinances.

Care shall be taken to avoid unnecessary cutting or damage to trees not in the construction area. The **CONTRACTOR** will be responsible for loss or damage to trees outside the permanent easement or rights-of-ways.

2.06 **BLASTING POLICY-** The **CONTRACTOR** shall have existing water, sewer, and gas mains located before blasting the construction site. The **minimum** distance that can be blasted from existing natural gas, water or wastewater lines is **25 feet** with an allowable weight in explosive pounds of ¾ pound. For increased weight in pounds of explosives, see the chart below from the **Tennessee Blasting Standards Act (Tennessee Code 68-105-104)** for the distance in feet from existing utilities:

ALLOWABLE MAX POUNDS OF EXPLOSIVES PER DAILY CALCULATIONS

For Distances Up to 300 Feet

Distance (ft.)	Weight (lbs.)	Distance (ft.)	Weight (lbs.)	Distance (ft.)	Weight (lbs.)
0-10	1/8	70	6.00	190	21.00
11-15	1/4	80	7.25	210	23.50
16-20	1/2	90	8.50	230	26.00
21-25	3/4	100	9.75	250	28.50
26-30	1.00	110	11.00	270	31.00
40	2.25	130	13.50	290	33.50
50	3.50	150	16.00	300	34.75
60	4.75	170	18.50		

For Distances 301-ft.to 5000-ft.
$W(lbs.) = (d(ft.)/55)^2$

For Distances 5001-ft. and Up
$W(lbs.) = (d(ft.)/65)^2$

The developer/contractor will need to submit a blasting plan to Smyrna Utilities showing their pounds of explosives per hole.

SECTION 3 - MATERIALS

3.01 **GENERAL** - All materials to be incorporated in the project shall be first quality, new and undamaged material conforming to all applicable portions of these specifications. All materials must be furnished by the **CONTRACTOR,** and with all applicable taxes paid by the **CONTRACTOR**, and must conform to applicable portions of these specifications. Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times. All pipe, fittings, and appurtenances left exposed on the project shall have all openings protected from the entry of foreign material and animals. At locations of bends, fittings, hydrants, as directed by the Town of Smyrna, and wherever reaction blocking is necessary, it shall be considered an integral part of the water line work, and no separate payment shall be made for it.

3.02 **WATER** - Water used in mixing concrete shall be clean and free from organic matter, pollutants and other foreign materials.

3.03 **DUCTILE IRON PIPE & FITTINGS** - All pipe sizes 12" and larger in diameter shall be ductile iron meeting all the following specifications. Pipe sizes 12" to 16" in diameter shall be Class 350 ductile iron, and all pipes the sizes 18" and larger in diameter shall be Class 52 ductile iron. Ductile iron pipe and fittings shall be centrifugally cast in metal or sand-lined molds and shall conform to the specifications of ANSI A21.51/AWWA C151. It shall be made and tested in accordance with ASTM A339 and shall be subjected to and able to withstand a hydrostatic pressure of 500 psi. The maximum depth of pits shall be half that allowed in the AWWA specifications. Pipe shall be minimum pressure class 350.

Pipe shall be furnished in lengths of 18' to 20' and unless otherwise indicated, shall be provided with a push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U. S. Pipe and Foundry Company), Super Bell-Tite (Clow Corporation), or other joints of similar type and equal quality. All joints located in a casing pipe shall be in an approved restraint joint system. They shall be UL approved and able to withstand a minimum pressure of 350 psi of operating pressure and shall meet ANSI 21.11/AWWA C111. Gaskets and lubricant shall be furnished with the pipe.

Pipe and fittings shall be furnished with standard thickness cement lining on the inside with a bituminous seal coat and a bituminous coating on the outside. Cement lining shall conform to ANSI A21.4. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices. The exterior of the pipe shall be clearly marked to indicate the manufacturer, date of manufacture, the pipe class and weight. Exterior markings shall also positively identify the pipe as being Ductile Iron.

The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.

The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.

Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

All pipes shall have a 12 AWG solid copper tracer wire attached to the crown (the top) of ductile iron pipe installed in accordance with manufacturer's recommendation. The tracer wire shall be placed to the top of each valve box but shall not be wrapped around the valve body or assembly in any way and shall be compatible with Town location equipment.

3.04 **PLASTIC WATER PIPE & FITTINGS** - All pipe sizes 4" – 10" in diameter shall be PVC meeting all the following specifications. All plastic pipes shall be made from Class 12454-B polyvinyl chloride plastic (PVC 1120) as defined by ASTM D1784. All PVC pipes shall meet the specifications of AWWA C900 (DR-14) with a minimum pressure class of 200 psi.

All pipes shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be conducted for each machine on each size and type of pipe being produced, as specified below:

1. Flattening Test: once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

2. Acetone Test (Extrusion Quality Test): once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the test.

3. Quick Burst Test: once per 24 hours in accordance with ASTM D1599.

Minimum Bursting:

DR	Pressure Rating	Pressure (psi)
14	200	985

4. Impact Tests: for 6 inches and larger, once per shift in accordance with ASTM D2444; for 4 inches and smaller, once each two hours in accordance with ASTM D2444.

5. Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM D2122.

6. Bell Dimension Test: once per hour in accordance with ASTM D3139.
If any specimen fails to meet any of the above-mentioned tests, all pipes of that size and type manufactured between the test periods must be scrapped and a full set of tests re-run.

All pipes shall be manufactured in the United States of America. All pipes for any one project shall be made by the same manufacturer.

All 6 inch pipes may be furnished in the manufacturer's standard laying lengths of 20 feet, 38 feet, or 40 feet. Pipe 8 inches and larger shall be furnished in 20 feet lengths. The Contractor's methods of storing and handling the pipe shall be approved by the Town of Smyrna and as noted in Material, Service and Facilities GC-6.02 & GC-603. All pipes shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed water line routes will not be allowed.

Certain information shall be applied to each piece of pipe. At the least, this shall consist of:

1. Nominal size
2. Type of material
3. DR or class
4. Manufacturer
5. NSF Seal of Approval

Pipe that fails to comply with the requirements set forth in these specifications shall be rejected by the Town of Smyrna for installation. Any pipe found not to meet these specifications after installation shall be removed and approved pipe installed at the expense of the contractor.

The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. All pipes located in a casing shall be in an approved restraint joint system. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.

The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.

Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be approved for being in contact with potable water and shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name. In no case shall lubricant other than that supplied by the pipe manufacturer be used.

Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell and ring joints with rubber compression gaskets as manufactured by the Clow Corporation, Johns-Manville, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain-Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.

Standard, compact and special fittings shall be ductile iron. All standard size fittings shall conform to the specifications of ANSI A21.10/AWWA C110. All compact fittings shall conform to ANSI A21.53/AWWA C153 specifications. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.

Fittings shall be lined with enamel line or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.

Fitting laying lengths shall conform to ANSI A21.10/AWWA C110 (standard) or ANSI A21.53/AWWA C153 (compact) specifications.

Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

All pipes shall have a 12 AWG solid copper tracer wire attached to the crown of plastic pipe installed in accordance with manufacturer's recommendation. The tracer wire shall be placed to the top of each valve box but shall not be wrapped around the valve body or assembly in any way and shall be compatible with Town location equipment.

3.05 **GATE VALVES** - Valves on water lines twelve inches (12") and smaller shall be of double disc, parallel seat, iron body bronze mounted type or resilient wedge, iron body, iron gate with bond-in-place Nitrile elastomer designed to work equally well with pressure on either side of the gate. All gate valves shall be in accordance with or exceed AWWA C500. Working pressure shall be 200 psi.

Valves ten inches (10") and smaller shall be Mueller A-2361-23, M&H 7571, American Flow Control Series 2500, or equal, with mechanical joints. All gate valves shall be resilient seated, manufactured to meet or exceed the requirement of AWWA C509 latest revision. Valves shall be suitable for installation in an approximate vertical position in buried pipelines. Stem seal shall consist of three (3) 0-ring seals. All valves shall open to the left (counterclockwise) with non-rising stems and shall be provided with a 2-inch square operating nut. All internal and external exposed surfaces shall be fusion-bonded epoxy coated with an approved epoxy coating to a minimum thickness of 6 mils, complying fully with AWWA 550 and certified to NSF61. Bodies shall be constructed of cast iron (ASTM A126, Class B) and shall have integrally cast mechanical joint ends in accordance with AWWA C111. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer. Valves shall be a steel body of molded-in vulcanized Buna-N bonded to the valve body. Valves shall be furnished with mechanical joint ends in accordance with ANSI A21.11 unless otherwise shown or directed.

Valves shall be complete when shipped and the manufacturer shall use due and

customary care in preparing them for shipment so as to avoid damage in handling or in transit. Particular care shall be taken to see that all valves are completely closed before shipment.

3.06 **BUTTERFLY VALVES** - Valves on water lines sixteen inches (16") and larger shall be butterfly valves, be designed for direct burial service, and meet or exceed performance requirements for water application of applicable standards such as AWWA C504. Valves shall be fitted with operators designed to accept Metro Valve Box "John Bouchard & Sons Company, No. 8006"; valves shall open to the left. All butterfly valves shall be of the tight closing, rubber-seat type. Valves shall be bubble-tight at rated pressures in either direction, and shall be satisfactory for applications involving throttling service and/or operation and for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90^{o} from the full open position to the tight shut position. Regardless of valve size, angular mis-position of disc can be 1^{o} off center without leakage. The manufacturer shall have manufactured tight-closing, rubber-seat butterfly valves for a period of at least five (5) years.

All valve bodies shall be cast iron ASTM A-126 Class B, narrow body design. Flange drilling shall be in accordance with ANSI B16.1 standard for cast iron flanges. Body thickness shall be in strict accordance with AWWA C504 where applicable.

All valve discs shall be constructed either of cast iron ASTM A-48 with stainless steel seating edge or ductile iron ASTM A-536 with stainless steel seating edge. The disc shall not have any hollow chambers that can entrap water. All surfaces shall be visually inspected and measurable to assure all structural members are at full design strength. Disc and shaft connection shall be made with stainless steel pins.

Valves shall be Dresser Manufacturing Company No. 450 butterfly valve, Henry Pratt Company "Groundhog," American Darling Class 150B, or equal.

All shafts shall be turned, ground and polished and constructed of 18-8 Type 304 or Type 316 stainless steel. Shafts shall be two-piece, stub-type keyed for operator connection. Shaft diameters shall meet minimum requirements established by the latest revision of AWWA Standard C504 for their class where applicable.

All seats shall be of a synthetic rubber compound. Seats shall be a full 360^{o} without interruption and have a plurality of grooves mating with a spherical disc edge-seating surface. Valve seats shall be field adjustable around the full 360^{o} circumference and replaceable without dismantling operator, disc or shaft and without removing the valve from the line. Manufacturer shall certify that the rubber seat is field replaceable.

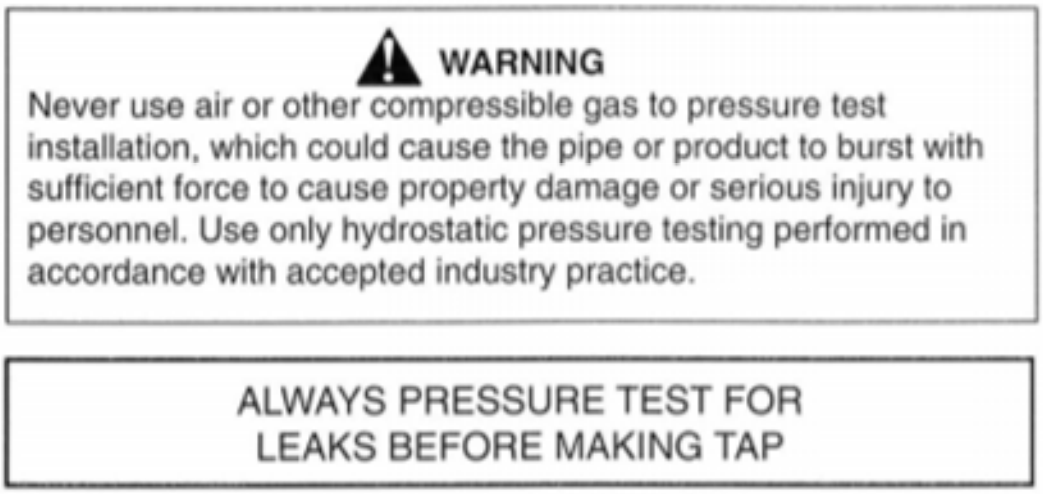
All valves shall be fitted with sleeve-type bearings. Bearings shall be corrosion resistant and self-lubricating. Bearing load shall not exceed 1/5 of the compressible strength of the bearing or shaft material.

Valve operators shall conform to AWWA Standard C504 and shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping and fluttering.

Hydrostatic and leakage tests shall be conducted in strict accordance with AWWA Standard C504.

3.07 **TAPPING SLEEVES AND VALVES** - For all pipes less than ten inches (10") in diameter, tapping sleeves shall consist of a cast iron body with removable bolts, mechanical joint gasket design giving 360^0 pipe coverage and cast iron flange to accept standard tapping valve. The valve shall conform to all applicable specifications for gate valves and shall be supported by precast concrete block 15'' x 15'' x 6''. In addition, all tapping sleeves shall be hydrostatically tested at 200 psi for two (2) hours. Tapping sleeve shall be MJ Mueller H-615 or approved equal.

For all pipes greater than or equal to ten inches (10") in diameter, tapping sleeves shall consist of a cast iron body with removable bolts, mechanical joint gasket design giving 360° pipe coverage and cast iron flange to accept standard tapping valves. Tapping sleeve shall be MJ Mueller H-615 or approved equal. All tapping sleeves shall be hydrostatically tested at 200 psi for two (2) hours, and shall be manufactured as tapping valves with line up grooves. Tapping valve shall be Mueller T-2360, T-2361 or approved equal.



3.08 **VALVE BOXES** – Valve boxes for the water distribution system shall be made of concrete as shown in the standard details and shall be of the heavy roadway type. Base section shall be enlarged to enclose and protect the valve-operating nut without being in contact with the valve or the pipe at any point. Top section shall be adjustable for elevation. Backfill around valves and box shall be tamped to maintain proper alignment of the box. Valve boxes that are **not plumb or not properly centered will not be accepted.**

All valve boxes shall be provided with covers on which the word "WATER" is cast in raised letters. Boxes shall be suitable for installation on mains laid at depths specified. Additional compensation will not be provided for deeper valve boxes made necessary by installation of mains at depths greater than minimum depths specified.

Valve boxes shall have an inside opening of not less than 11" by 13". Standard precast reinforced concrete boxes having the same opening shall be provided. Concrete boxes and footing blocks shall be made of 4,500 psi concrete by an approved manufacturer. Cast iron valve boxes shall be as manufactured by an approved supplier shall require prior approval before installation.

3.09 **FIRE HYDRANTS** - Fire hydrants shall be iron bodied, fully bronze mounted, hydrants manufactured to equal or exceed AWWA Standard C502, UL246 and FM1510 specifications latest revision. Hydrants shall be suitable for 200 psi working pressure and shall be subjected to a test pressure of 400 psi. Inlet connection shall be 6" mechanical joint. Main hydrant valve shall be reversible compression type, closing with the pressure, with 5 ¼ inches valve opening.

All hydrants shall be equipped with two (2) 2½" hose nozzles, one 4 ½" pumper nozzle, breakable safety flange, and stem coupling. Threads on hose and steamer nipples, operating nuts, and cap nuts shall conform to local Water Department standards. Bronze nozzles shall be securely locked to prevent them from blowing off. Hose and pumper nozzles shall be field replaceable. Hose threads shall be National Standard. Nozzle caps shall be equipped with non-kink chains.

Hydrants shall be of the "dry head" type with an oil or grease reservoir and provision for automatic lubrication of stem threads and bearing surfaces each time the hydrant is operated. Double O-ring seals shall be provided to keep water out of the hydrant top. Operating nut style shall be 1½" pentagon with direction of opening to the left and shall be equipped with a weather cap. The operating nut, main stem, coupling and main valve assembly shall be capable of withstanding input torque of 200 ft/lbs., in opening or closing directions. The hydrant shall open by being turned to the left and be so marked on the bonnet in cast letters with an arrow.

Fire hydrants shall be supplied with multi-port drain ports. Drain valves operated by springs or gravity will not be acceptable. A positive stop shall be provided on the operating stem to prevent over travel when operating the valve. It should not be necessary to excavate to repair or inspect internal parts. It should be removable without disturbing the line joint or nozzle section of the hydrant. Fire hydrants shall be supplied with a bituminous coating for the buried portion of hydrant and a high visibility yellow enamel finish for above ground portions of the hydrant with the exception of the bonnet which shall be ordered in factory primer gray. Inside of the hydrant shoe shall be covered with thermoset epoxy coating.

Hydrants shall be Mueller Super Centurion 250 or M&H Valve Model 129 or approved equal. Hydrants shall be installed a maximum of 400 ft. from commercial properties and a maximum of 500 ft. from residential properties.

3.10 **FIRE LINES-** Installation and materials shall be as follows:

Shop drawing submittals shall be made to Smyrna Utilities Department for review and approval. A design drawing shall be submitted to Smyrna for review and approval prior to start of any construction.

The developer/contractor shall provide and install the materials for the tap to the main line. Contractors will make the tap to the existing main line up to twenty four inches (24") in diameter, subject to current tapping fees set forth by Smyrna.

All fire line installations shall require a reduced pressure backflow preventer (RPBP) installed at the exterior of the structure and enclosed in an above ground hot-box as

specified in Smyrna's cross-connection policy. All backflow preventers shall be placed outside at the property line. The backflow shall be a Wilkens backflow preventer or an approved equal. From the tap from the existing water main to the backflow, the utilities department construction inspector will inspect the fireline. From between the backflow to the building, a state certified fireline installer can only install the fireline per the fire suppression plans only.

Installation shall be completed as specified by Smyrna and inspected by an authorized official of Smyrna.

3.11 **CASING PIPE** - The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association Specifications for "Pipelines for Carrying Flammable and Nonflammable Substances". Casings shall be pipe conforming to the requirements of ASTM Designation A-252. The steel casing pipe shall have the minimum yield strength of 35,000 PSI and shall have the minimum wall thickness shown in the following table:

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE FOR E72 LOADING

Carrier Pipe Diameter	Casing Pipe Diameter	Nominal Thickness
4"	12"	0.250"
6"	18"	0.312"
8"	20"	0.375"
10"	24"	0.375"
12"	24"	0.375"
14"	26"	0.500"
16"	30"	0.500"
18"	30"	0.500"
20"	36"	0.500"
24"	42"	0.500"
30"	48"	0.500"
36"	54"	0.625"
42"	60"	0.625"
48"	66"	0.625"

When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 1/16 inches greater than the thickness shown. The carrier pipe inside the casing pipe shall be installed with restraining gaskets or a bell restraint harness.

All service lines crossing pavement shall be encased in a casing pipe. All water mains crossing paved areas and/ or roadways shall be encased in a casing pipe. The casing pipe shall be a minimum of twice the size of the carrier pipe. All casing pipes shall extend 10 feet beyond the curb or outside of the paved area. If the water pipe is crossing other utilities where there are not 18-inches of vertical separation, then the water pipe shall be encased in a casing pipe.

3.12 **SERVICE INSTALLATIONS**

The service assembly shall include a two inch (2") Kennedy KS-FW. 228D2X gate valve threaded or approved equivalent, two inch (2") Type K Copper, two inch (2") PEX (blue

in color), or approved equivalent material service pipe, meter yoke, meter, meter box, and tapping saddle as required. Municipex Pipe or approved equal shall be accepted. No gooseneck assembly shall be used at any time when installing a service pipeline.

PEX pipe shall be manufactured using high-pressure peroxide extrusion method for crosslinked polyethylene (PEXa). PEX pipe shall have a co-extruded PE shield that protects the pipe against ultraviolet light (sunlight) for an extended time. PEX pipe shall meet or exceed the requirements of ASTM F876, CSA B137.5 and PPI TR-3, and is certified to NSF Standards 14/61 and AWWA C904. Pipe shall meet the requirements of ASTM F2023 for chlorine resistance.

PEX pipe shall be produced in SDR-9 copper tube sizes (CTS) so that it is compatible with AWWA C800 valves and fittings when used with manufacturer's recommended insert which is required to stiffen the pipe. Pipe shall be compatible with fittings certified to ASTM F2080 and CSA B137.5.

The maximum temperature and pressure ratings shall be in accordance to ASTM F876, CSA B137.5 and PPI TR-3. The temperature and pressure ratings apply to the application of PEX pipe conveying hot and cold water at the 2.0 safety factor on allowable working pressure according to ASTM and CSA. The pipe shall withstand a maximum 200 psi (1380 kPa) operating pressure rating at 73.4°F (23°C) when using a 1.5 safety factor.

The corporation stop shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main at a vertical angle. This corp stop shall be similar to Ford FB 1000 series and/or equal. The threads on the corporation stop shall be Mueller.

Service pipe shall be 3/4-inch or 1-inch PEX pipe (blue in color) meeting ASTM F876, CSA B137.5 and PPI TR-3. No gooseneck assembly shall be used at any time. All water service lines shall be backfilled with quarter down (dust) 6" on bottom and sides and 12" on top. This shall be done from the water main to the meter.

Meter yokes/setters 5/8-inch x 3/4-inch with compression fittings shall be Mueller 234B24118R5---N (or Ford VBHH42-7WR-NL or approved equal) with a Ford C38-23-2.5-NL ¾-inch tailpiece. Meter yokes/setter for 1-inch meters shall be Mueller 389B24118R5N (or Ford or approved equal) and the tailpiece shall be Ford C38-44-2-625NL. Meter yokes for 1½-inch shall be Mueller 063B2424--5N (or Ford or approved equal), and 2-inch shall be Mueller 087B2424--5N (or Ford or approved equal). Note, the 1½-inch and 2-inch meter yokes must not have a bypass line. Each assembly shall include a meter check valve. Each meter yoke/setter shall have an integral angle stop and provisions for locking.

All meters shall be frost proof, sealed register, displacement type with bronze cast and made by Badger Meters, Inc. Meters shall be straight reading in gallons. Meters 1 inch in size shall be Badger M70. Meters 1½-inch in size shall be Badger M120 B81. Meters 2-inch in size shall be Badger M170 B81. Larger meters shall have flanged connections and shall be Badger M25.

All meter boxes shall be installed in a grass or landscaped area. The meters and meter boxes are to be set no closer than 2-ft. minimum from a paved area at the widest point.

No meter shall be set in an area that is landscaped with plants and/or trees that will be closer than 3-ft. to the meter box at maturity. All meters and meter boxes shall have 2-ft. of clearance all around from other utilities or permanent structures. Meter boxes that are in banks of two (2) meters or more shall have a minimum separation of space of 2-in. between boxes.

Meter boxes for 5/8-inch x 3/4-inch assemblies shall be Sigma RMB132418-SW or approved equal with a Sigma RMB1324-L-RT lid or approved equal. For 1-inch to 2-inch meters, the meter box shall be Sigma RMB173018-SW or approved equal with a Sigma RMB1730-L-RT lid or approved equal. Larger meter's boxes shall be G&C 660 meter vault or approved equal. For different applications, larger meters will require approval from the Town of Smyrna Water Department prior to ordering or installing the meter boxes. Meter box lids shall have a hole in it to house an Itron AMI endpoint. Also, when the meter box is set, it should be installed with enough space around the meter to where an Itron leak sensor device can be attached to the water service pipe.

Curb stops shall be as manufactured by Ford or approved equal. The ¾-inch shall be Model B43-232WR-Q-NL, 1-inch shall be Model B43-344WR-Q-NL and the 1½-inch and 2-inch shall be Model BF13-666W-NL and BF43-777WR-Q-NL.

Smith Blair tapping saddles, or approved equal, shall be used for PVC pipes. A single band stainless steel, or approved equal. It shall be threaded to accept the corporation cock specified above. No taps larger than 1 inch shall be made in any size pipe without approval by the A/E. On ductile iron pipe (DIP), the service line shall be a direct tap on the main unless otherwise specified by the Town's affiliate.

3.12.1- Gang Water Meter Vaults

A. Concrete Vault

Gang water meter vaults are a Holton concrete vault or an approved equal. The vault concrete shall have a minimum of 4,000-psi strength and cured for 28-days. Each vault shall have a two (2) inch drain at the base of the vault. The concrete vault is to meet the current requirements of ASTM C857 and C858 for structural design and loadings.

The vault hatch shall be a Halliday Model aluminum lid or approved equal. The hatch shall have a two (2) inch thick weather proof and water resistant insulation adhere underneath the hatch. The glue/adhesive shall be weather proof and water resistant. The lid shall be bolted to the concrete vault.

An antenna hole shall be cut for each individual meter for AMI (advanced meter infrastructure) meter reading device installation needs.

B. Water Service

The gang meter vault main shall be a four (4) inch Class 350 ductile iron pipe (DIP), which is to be tied into the proposed water main with a fitting and/or mechanical joint sleeve. Each water service shall be a direct tapped into the main by a corporation stop (3/4-in. Ford FB-1600-3NL or approved equal; 1-in. Ford FB1600-45-NL or approved equal).

The corporation stop is connected to the meter setter by a brass meter coupling of the correct size, which is to be installed on the meter setter on the downstream and

upstream sides. The brass meter couplings are to be a Ford or an approved equal (3/4-in. C38-23-2-5-NL; 1-in. C38-44-2-625-NL). On the upstream (customer) side of the setter, there shall be an 18-in. brass nipple. This brass pipe shall be encased in a two (2) inch Schedule 40 PVC sleeve that is six (6) inches long through the concrete vault wall on the upstream (customer) side of the vault. The plastic casing pipe shall be great foamed or mudded at the insides and outsides of the vault. All water service assemblies shall be installed an even amount of assemblies starting from the center of the concrete vault to its edge.

The water service assembly shall be hydrostatically tested at factory at 100-psi per service for two (2) hours, and it shall be accompanied with a certification of test. This will be reviewed by the Town's construction inspector(s) before installation of the vault to the water system in any manner.

C. Installation

All gang meter vault shall be installed after the testing on domestic water main. Each vault shall have its own valve on the water main for its operational needs. If the gang meter vault is used for commercial uses, then each water meter service shall have a reduce pressure backflow preventer install on the upstream (customer) side of the service outside of the vault.

The gang meter vault shall be installed by the CONTRACTOR with the proper supervising inspection by the Town's construction inspector. The vault connections shall only use either a mechanical jointed sleeve or a mechanical jointed fitting. The mechanical jointed fitting shall be no greater than a 45^0 degree fitting. No 90^0 degree fittings are allowed. If gang meter vault has to change elevation vertically, then two (2) fittings only can be used to adjust the height of the vault.

If two (2) meter vaults are to be used together for water services, then they shall be installed in series while using a mechanical jointed sleeve of the proper size to connect the two (2). At the end of the carrier pipe outside the vault, a mechanical jointed cap shall be used, and a concrete thrust block shall be pour to secure the cap. The concrete shall have the strength of 3000-psi and poured from a concrete truck.

The bedding of gravel, crush stone no. 67, shall be a minimum of six (6) inches on the bottom of the vault. The concrete vault shall be installed 3-in. to 6-in. above final grade with good soil/dirt, which is to be sloped away from the vault on each of its sides. The meter vault shall have a minimum distance of two (2) feet from a paved area. No meter vault is to have landscape with plants and /or trees in this two (2) feet area. The meter vault shall have a minimum of two (2) feet clearance from any other utilities (electrical, sanitary sewer, communications, etc.)

3.13 **CONCRETE** – The strength of concrete shall be 3,000 psi unless otherwise shown on the drawings. All concrete exposed to weather shall be air entrained. Concrete slump shall be proportional and produced to have a slump of 3-inches with a 1-inch tolerance. Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the Town of Smyrna's representative.

3.14 **READY MIX CONCRETE** - Ready-mix concrete shall be secured only from a source

approved by the **ENGINEERS**, and shall conform to ASTM Designation C94, latest revision, "Specifications for Ready-Mix Concrete". Before any concrete is delivered on the job site, the supplier must furnish a statement of the proportions of cement, fine aggregate and coarse aggregate to be used for each mix ordered, and must receive the **ENGINEER's** approval of such proportions.

3.15 **CLASS "A" CONCRETE** - Class A concrete shall have a minimum compressive strength of 3000 psi at 28 day break.

3.16 **CLASS "B" CONCRETE** - Class B concrete shall have a minimum compressive strength of 2000 psi at 28 day break.

3.17 **METAL REINFORCING** - Reinforcing bars shall be Grade 60 steel conforming to ASTM Designation A615, latest revision, "Standard Specifications for Billet Steel Bars for Concrete Reinforcement". Bars shall be deformed with a cross sectional area at all points equal to that of plain bars of equal nominal size.

3.18 **CRUSHED STONE** - Crushed stone for bedding or backfill shall be Tennessee Department of Transportation Standard Size No. 67 and shall meet State Highway Department Standards for road surfacing.

3.19 **PAVEMENT SURFACES –** these specifications and the drawings make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT).

MINERAL AGGREGATE BASE: Class A, Grading D crushed stone (TDOT specifications, Section 303, subsection 903.05)

BITUMINOUS PRIME COATS: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)

CRUSHED STONE CHIPS: Size 6 or Size 7 (Subsection 903.14)

DOUBLE BITUMINOUS SURFACE: for both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.02 and 904.03)

ASPHALTIC CONCRETE BINDER: Grading B or C (Section 307), as directed by the Town of Smyrna.

BITUMINOUS TACK COAT: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade SS-1 (Section 403, Subsections 904.02 and 904.03).
ASPHALTIC CONCRETE SURFACE: Grading “D” or “E” (Section 411)
as approved by the Town of Smyrna.

PAVEMENT MARKINGS (WHITE AND YELLOW): Thermoplastic, Paint, Paint with Glass, Reflectors, Etc. Section 716.

3.20 **FLOWABLE FILL** – All flowable mortar shall be in accordance with the Standard Specifications for Road and Bridge Construction except as modified herein.

MATERIAL	SUBSECTION
Portland Cement, Type I	901.01
Fly Ash, Class C or Class F	AASHTO M295
Water	918.01
Chemical Additives	918.09

Fine aggregate shall conform to the requirements Subsection 903.01. Fine aggregate for concrete except that the gradation shall be as follows:

SIEVE SIZE	PERCENT PASSING
¾ - inch	100
No. 200	0-10

Flowable fill mortar shall be proportioned as follows:

MATERIAL	PER CUBIC YARD
Portland Cement, Type I	100 lbs. (Maximum)
Fly Ash, Class C or Class F	250 lbs. (Minimum)
Fine Aggregate	2800 lbs.
Water	60 gal (Approximate)

The above proportions may be adjusted by the **ENGINEER** to obtain the consistency required for satisfactory flow. Consistency shall be determined as follows:

Place an open-ended cylinder (pipe) three inches in diameter by six inches in height in an upright position on a smooth, level surface. Fill the cylinder with a representative sample of the flowable fill mortar proposed for use. Remove the cylinder by lifting it straight up thus allowing the sample to diffuse on the smooth, level surface. The flowable fill mortar should diffuse into a circular shape having an approximate diameter of not less than eight (8) inches.

SECTION 4 - EXCAVATION & BACKFILL

4.01 **GENERAL** - The **CONTRACTOR** shall perform all required excavation and backfilling incidental to the installation of water mains and other appurtenances under this contract. Excavation shall be carried to the depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, structures or appurtenances. Care shall be taken to provide a firm, undisturbed, uniform surface in the bottoms of trenches and excavations for structures. Where the excavation exceeds the required depth, the **CONTRACTOR** shall bring the excavation to proper grade through the use of an approved incompressible backfill material (generally crushed stone or fill concrete, depending upon the nature of the facility to be placed thereon). In the event unstable soil conditions are encountered at the bottom of the excavation, the **INSPECTOR** may direct the **CONTRACTOR** to continue the excavation to firm soil or to provide pilings or other suitable special foundations.

The **CONTRACTOR** shall take such precautions as may be necessary to avoid endangering personnel, pavement, adjacent utilities or structures through cave-ins, slides, settlement or other soil disturbance resulting from his operations.

Backfilling shall be carried out as expeditiously as possible, but shall not be undertaken until the **INSPECTOR** has been given the opportunity to inspect the work. No work shall be backfilled until the **INSPECTOR** has observed the installed work or has given the **CONTRACTOR** permission to backfill. The **CONTRACTOR** must carry out all backfilling operations with due regard for: the protection of pipes, structures and appurtenances; the use of prescribed backfill materials; and procedures to obtain the desired degree of compaction.

The **CONTRACTOR** shall be responsible for storage of excavated material, disposal of surplus excavated material, trench dewatering and other operations incidental to excavation and backfilling operations.

4.02 **PREPARATION OF THE SITE -** Before starting construction, remove from the work site all vegetative growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the project engineer specifically indicates are to be removed. Dispose of this refuse material in a manner acceptable to the Town of Smyrna.

In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the drawings, specifically listed in the specifications, marked on the site, or identified by the Town of Smyrna Director of Utilities. In no case damage or remove such growth without written permission from the Owner.

If the area to be excavated is occupied by trees, brush, or other vegetative growth, clear such growth, grub the excavated area, and remove all large roots to a depth of not less than 2 feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the Town of Smyrna. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.

Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is specifically ordered by the Town of Smyrna. Take special precautions to protect and preserve such growth throughout all stages of the construction.

Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

4.03 **UNSUITABLE MATERIALS** - Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, sub grade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1 inch to 2 inch lifts of crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6 inches of this refill shall be No. 67 (TDOT) crushed stone for bedding.

4.04 **CLASSIFICATION OF EXCAVATION** - Excavation shall be unclassified on this project.

4.05 **TRENCH EXCAVATION** - Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings or specifically required by the Director of Utilities, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the design engineer on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance determined by the following formula: O.D + 20 inches, where "O.D." represents the outside diameter of the pipe in inches. When approved in writing by the design engineer and the Director of Utilities, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to non-vertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula O.D + 20 inches, shall be at the expense of the Contractor and may be cause for the Town of Smyrna to require that stronger pipe and/or a higher class of bedding be used at no cost.

Do not excavate pipe trenches more than 200-feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the Director of Utilities deems necessary to maintain vehicular or pedestrian traffic.

The **CONTRACTOR** shall plan his operations so as to cause a minimum of inconvenience to property owners and to traffic. No road, street or alley may be closed unless absolutely necessary and then only if the following conditions are met:

1. Permit is secured from appropriate State, County or Municipal authorities having jurisdiction.
2. Fire and Police Departments are notified before the road is closed.
3. Suitable detours are provided and are clearly marked.

No driveways shall be cut or blocked without first notifying the occupant of the property. Every effort shall be made to schedule the blocking of drives to suit the occupant's convenience, and except in case of emergency, drives shall not be blocked for a period of more than eight (8) hours.

The **CONTRACTOR** shall furnish and maintain barricades, signs, flashing lights, and other warning devices as necessary for the protection of public safety. Flagmen shall be provided as required on heavily traveled streets to avoid traffic jams or accidents.

Trench width shall be held to a minimum consistent with proper working space for assembly of pipe. Minimum trench width shall be diameter of pipe plus twenty inches (20"). Maximum trench width up to a point one foot above top of pipe shall be limited to the outside pipe diameter plus thirty inches (30"). Excavate rock to a depth of not less than 6 inches below the bottom of pipe up to 24 inches in diameter, not less than 8 inches below the bottom for 24 inch to 36 inch diameter pipes, and not less than 12 inches below the bottom for pipes larger than 36 inches in diameter, if rock extends to such depth. Then backfill the space below grade with No. 67 (TDOT) crushed stone or other approved material, tamp to the proper grade, and make it ready for construction.

Trench walls shall be kept as nearly vertical as possible with due consideration to soil conditions encountered and when necessary, sheeting or bracing shall be provided to protect life and property.

Where unstable soil conditions are encountered at the trench bottom, the **CONTRACTOR** shall remove such additional material as may be directed by the **INSPECTOR** and replace the excavated material with crushed stone.

The **CONTRACTOR** shall excavate by hand wherever necessary to protect existing structures or utilities from damage or to prevent over-depth excavation in the trench subgrade. Excavated material shall be stored safely away from the edge of trench and in such a way as to avoid encroachment on private property.

4.06 **EXCAVATION FOR STRUCTURES** - Excavation for structure shall be only as large as may be required for the structure and for the working room around the structure. On earth, excavation shall generally extend to the outer limits of the structure at the bottom, and shall slope outward at such an angle as may be required for stability of excavated face. In rock, excavation shall be carried to a point six inches (6") outside the structure so that no rock is left within six inches (6") of the finished structure. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall, at his own expense, fill the void with either concrete or granular material approved by the Town of Smyrna.

Care shall be taken as the excavation approaches the desired grade to avoid over-depth excavation and provide a firm and undisturbed soil surface on which footings, slabs or foundations are to be placed. Should the **CONTRACTOR** excavate below the desired grade level, the excavation shall be brought to grade by the use of concrete or compacted crushed stone at the expense of the **CONTRACTOR**. The use of tamped earth backfill under foundations, footings or slabs will not be acceptable.

Excavation for other structures may be performed with non-vertical banks except

beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2- foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings.

Should the material found at the desired subgrade appear to be unstable or otherwise unsuitable for support of the structure, such conditions shall be immediately called to the attention of the **ENGINEER**. The **ENGINEER** may direct that such unsuitable material be removed and replaced with compacted crushed stone.
The **ENGINEER** may modify the foundation design to suit the condition, or he may determine that the bearing capacity of the material is suitable for the load to be supported; but in any case he shall provide written instructions to the **CONTRACTOR** as to the procedure to be followed.

4.07 **ROCK EXCAVATION** - The **CONTRACTOR** shall exercise all necessary precautions in blasting operations. Suitable blasting mats shall be provided and utilized as required. Blasting shall be done only by experienced personnel. Careless shooting, resulting in the ejection of stones or other debris during blasting, shall be corrected immediately by the **CONTRACTOR'S** representative.

No blasting shall be done unless the **CONTRACTOR** shall have taken out the necessary insurance to fully protect the **TOWN OF SMYRNA** from all possible damages resulting from the blasting operations. The blasting shall be done in accordance with all recognized safety precautions and in accordance with regulations of authorities having jurisdiction. In addition, the **CONTRACTOR** shall exercise the necessary care to safeguard and adequately protect stored blasting materials.

Where rock is encountered in the immediate vicinity of gas mains, telephone cables, building footings, gasoline tanks, or other hazardous areas the **CONTRACTOR** shall remove the rock by means other than blasting. Care shall be taken in blasting operations to see that pipe or other structures previously installed are not damaged by blasting. In general, blasting shall not be done within twenty-five feet (25') of the complete pipeline.

4.08 **SHEETING, SHORING, AND BRACING**

Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.

Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5-feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5-feet deep when examination of the ground indicates hazardous ground movement may be expected. Guard the walls and faces of all excavations in which employees are

exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

The contractor shall comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Tennessee and shall be subject to approval by the design engineer for the project. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, damage to any property, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.

Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the project engineer.

Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the design engineer, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.

Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.

The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.

4.09 **REMOVAL OF WATER** - The **CONTRACTOR** shall be responsible for handling run-off, and ground water in such a way as to maintain trenches and excavations in a dry condition until the work is completed. Pumps, piping, well points, labor, fuel, and other facilities necessary to control, intercept, remove and/or dispose of water shall be provided by the **CONTRACTOR** at his own expense.

Water shall be kept out of trenches and other excavations to the extent necessary to protect the supporting strength of the foundation material, permit efficient, and satisfactory assembly or replacement of facilities, and to prevent floating or misalignment. Water removed from trenches or holes shall be discharged to natural drains in such a way as to avoid danger or damage to adjacent property owners or sewers.

Where the **CONTRACTOR** fails, refuses, or neglects to control water in trenches or other excavations, and corrective work is deemed by the **ENGINEER** to be necessary as a consequence thereof, such work shall be at the **CONTRACTOR'S** expense.

4.10 **STORAGE OF EXCAVATED MATERIAL** - Excavated material shall be deposited in such a manner as to avoid danger to workmen, water line, or traffic, and to cause minimum inconvenience through blocking of drives, sidewalks, natural drains, etc. Where indicated on the drawings, or necessitated by prevailing conditions prevailing, the **CONTRACTOR** shall haul away and stockpile excavated material.

4.11 **DISPOSAL OF SURPLUS EXCAVATED MATERIAL** -
Whenever practicable and approved by the Town of Smyrna, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the Town shall be used for these purposes. Any materials not so approved by the Town or used shall be considered waste materials and disposed of by the Contractor at no additional cost.

Waste materials may be deposited in spoil areas at locations approved by the Town of Smyrna. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 8.05, Seeding.

Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.

The disposal of waste materials shall be considered an integral part of the excavation work and one for which no separate payment shall be allowed.

4.12 **BACKFILL FOR TRENCHES**

A. **General** - Backfilling of trenches will proceed as pipe laying progresses so that the trench will be filled in as rapidly as possible after the pipe has been assembled and inspected. The **CONTRACTOR** shall, however, afford the inspector ample opportunity for observing the assembled pipeline before placing the backfill and, if requested by the inspector shall delay the backfilling operation when the inspector is not present at the site.

Backfilling procedures will normally fall under three categories as follows:

1. Under the streets and highways with permanent type pavement (hot mix, concrete, etc.).

2. In areas subject to light or occasional traffic, either under temporary paving such as surface treatment or in unpaved areas (this category will include shoulders, and driveways, except where permanent type pavement is used).

3. Open field or other areas not covered under Item 1 or Item 2 above.

B. **Backfill for water main trenches** - Backfill under streets, or highways having permanent type pavement as indicated in category one shall consist of crushed stone suitably compacted for the entire trench depth. The crushed stone shall be carefully placed by hand around and under the pipe in layers not to exceed nine inches (9") in depth and shall be compacted by means of hand tamps or other approved tamping procedure. The gravel envelope (crushed stone No. 67) backfill shall be placed by approved method from six inches (6") on the bottom and sides of the pipe inverts up to a

point twelve inches (12") above the crown of the pipe and above this point may be placed by mechanical equipment. The gravel envelope shall have waterline excavation tape laid upon it. In any event the backfill shall be placed in layers not exceeding nine inches (9") and shall then be compacted by suitable mechanical means. All water mains shall have 30 in. of cover above the pipe.

Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D, and crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Owner. On heavily traveled roads and as required by the Town of Smyrna, cold mix or leveling course binder minimum of 4-inches thick shall be installed and maintained until permanent pavement is installed.

For categories two and three, the backfill around and up to a point twelve inches (12") above the **pipe shall be crushed stone where rock is encountered and acceptable granular material elsewhere**. When the backfill has been placed to a depth at least twelve inches (12") above the crown of the pipe, the remainder of the backfill in category two (areas subject to light traffic) shall consist of suitable excavated material placed and compacted in layers not exceeding twelve inches (12") in depth. **No rock larger than six inches (6") in any dimension may be included within the backfill. The compaction shall be obtained by means of a suitable mechanical tamper**.

Should the **CONTRACTOR** fail, refuse or neglect to systematically exclude or remove oversize rock from the backfill material, he may be required to place and compact the backfill material by other suitable methods, which will insure the rocks being removed.

The backfill for areas not ordinarily subjected to traffic, may consist of suitable excavated material placed by machine after the crushed stone backfill reaches a depth of twelve inches (12") over the crown of the pipe, and the backfill shall be compacted by means of a suitable wheeled vehicle such as a tractor or front end loader running longitudinally along the trench. After the backfill has been compacted in this manner additional fill material shall be placed in the trench to restore the original grade and provide a slight mound over the trench. This material shall again be compacted by means of a suitable wheeled vehicle. **No rock larger than six inches (6") in any dimension may be used in the backfill over the pipe and no rock larger than one half inch (1/2") may be used in the top twelve inches (12") of the backfill.**

Backfill up to the spring line of the pipe shall be placed as pipe laying progresses in order to maintain proper grade and alignment. Additional backfill shall not be placed until after the pipe has been inspected by the **ENGINEERS** and approved for backfill.

4.13 **ACCEPTABLE BACKFILL MATERIAL** - Where crushed stone backfill is required the crushed stone shall be No. 67 size as designated by Tennessee Department of Transportation Specifications and shall meet all requirements of the TDOT Specifications for crushed stone used in road surfacing.

Where crushed stone is not required, but the excavated material is unsuitable for use in the backfill, the **CONTRACTOR** may use fine dry selected earth or clay as backfill material. **Material containing excessive organic matter, stumps, roots, refuse or**

foreign matter or hard clay lumps that cannot be readily compacted will not be acceptable for use as backfill.

Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Town of Smyrna requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.

SECTION 5 - PAVEMENT REPLACEMENT

5.01 **GENERAL** - The **CONTRACTOR** shall be responsible for replacement of pavement removed or damaged by his operations. Pavement replacement shall be in accordance with this section of the specifications and in every case shall be equal to or better than the quality of pavement damaged or removed. The **CONTRACTOR** shall also be responsible for subsequent pavement failures during the warranty period, where such failures occur over or adjacent to trenches or other excavations by the **CONTRACTOR** and result from insufficient compaction of the backfill.

5.02 **PAVEMENT REMOVAL** - Where existing paved streets, roads, parking lots, drives or sidewalks must be disturbed during construction of the project the **CONTRACTOR** shall take the necessary steps to minimize damage. Permanent type pavement shall be cut or sawed in a straight line before removal and care shall be taken during excavation to avoid damage to adjacent pavement. Where trucks or other heavy equipment must cross curbs or sidewalks, such areas shall be suitably protected.

5.03 **SUBGRADE** - Before any base material is installed, compact the subgrade of the area to be paved to 98% of optimum density as determined by ASTM D698 (Standard Proctor).

The backfill material shall contain no topsoil or organic matter. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.

When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1 foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

Install a mineral aggregate base of the type specified above in accordance with Section 303 of the TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

5.04 **PAVEMENT REPLACEMENT** - Before trenching in paved areas the **CONTRACTOR** shall cut through the pavement in a straight line along the sides of the proposed trench so that the pavement may be removed and the trench may be dug without damage to the adjacent pavement. During construction suitable precautions shall be taken to protect the pavement edges and surfaces and minimize damage.

As soon as the pipe has been installed the trench shall be backfilled and a temporary pavement patch shall be provided in paved areas. The temporary pavement shall consist of a single or double surface treatment, which will protect the base, prevent "potholes" and provide a reasonable smooth pavement surface until the permanent patch is made.

The permanent pavement patch shall not be made until the job is nearing completion in order to allow maximum time for any further settlement. The permanent pavement replacement shall conform to typical road sections as stated in the current Subdivision Regulations for Smyrna, Tennessee.

The hot mix and surface treatment applications shall be in accordance with standard specifications and recommended practices of the Tennessee Department of Transportation.

BITUMINOUS PRIME COAT - Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallon per square yard.

ASPHALTIC CONCRETE BINDER - Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.30 gallons per square yard. Take care to prevent the bituminous material from splashing on exposed faces of curbs and gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder layer to the thickness shown on the standard drawings or as specified by the Town of Smyrna. Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

ASPHALTIC CONCRETE SURFACE - When the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under at a rate of 0.10 gallon per square yard. Take care to prevent the bituminous material from splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the tack coat has been properly cured, apply the asphaltic concrete surface layer to the thickness shown of the drawings or as specified by the Town of Smyrna. Apply the surface course as described above for the binder course.

SMOOTHNESS -The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4 inch in any direction when tested with a 12 foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects in a manner approved by the Town of Smyrna.

SAMPLING AND TESTING - Submit to the Town of Smyrna test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain approval of these reports before starting paving operations. Tests shall be made of the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests. When making surface tests, furnish one man to mark all surface defects for corrections.

Pavement replacement shall extend a minimum of one foot (1') beyond the trench line and shall include replacement of all defective pavement resulting from the **CONTRACTOR'S** operations, regardless of whether caused by blasting, trenching,

equipment operation, cave-in or other cause. Where the cut edge of pavement is less than one foot (1') from the edge of the trench or has been disturbed during construction, the **CONTRACTOR** shall cut through and remove existing pavement as required to permit a neat pavement patch. Irregular or uneven patches will not be permitted.

The **CONTRACTOR** shall be responsible for maintaining temporary patches during construction and shall promptly repair any defects. Upon completion of the work the paved surfaces shall be left in as good or better condition than before the start of construction.

The **CONTRACTOR** shall obtain a road cut permit and contract from the Highway Department for each crossing if required by controlling authority. The **CONTRACTOR** shall conform to all conditions of said permit and bear all costs associated with said permit.

SECTION 6 - INSTALLATION OF WATER PIPE AND ACCESSORIES

6.01 **GENERAL** - Water pipe shall be furnished and installed in accordance with details shown on the drawings. The work shall be done by experienced workmen employed by a general contractor licensed in the State of Tennessee with the appropriate classification. Pipe, fittings, valves and accessories shall be installed in strict accordance with these specifications and the recommendations of the manufacturer. Gaskets, bolts, lubricant and other accessories shall be furnished by or as recommended by the manufacturer.

The **CONTRACTOR** shall use top quality materials throughout and shall exercise care in the storage, handling and installation of the pipe and accessories. Trench bottoms must be carefully graded by hand to provide continuous support for the pipe except at bells where bell holes must be dug.

6.02 **HANDLING PIPE AND ACCESSORIES** - All water pipe, fittings, valves and other appurtenances shall be stored in a protected location where they will not be subject to physical damage or contamination. Pipe may be delivered to the trench site only if it is unloaded with suitable mechanical equipment and left in an area where it will not be a hazard or obstruction and will not be subject to flooding. Pipe, fittings, valves, hydrants shall not be rolled or dropped from trucks or trailers and shall not be left in roadside ditches.

Pipe clamps, slings, hooks, hoists, booms or other equipment as required for safe and efficient handling of pipe and accessories shall be provided at the trench site whenever pipe laying is in progress.

A suitable swab or brush shall be provided and shall be run through each and every joint of pipe to insure the removal of dirt and foreign objects. The pipe shall be inspected for defects immediately before being lowered into the ditch.

6.03 **INSTALLATION OF WATER LINES**

Lay water lines to and maintain at the lines and grades required by the drawings. All fittings, valves, and hydrants shall be at the required locations, the spigots centered in the bells, and all valves and hydrant stems plumb.

Unless otherwise indicated by the drawings, all water pipes shall have at least 30 inches of cover. No departure from this policy shall be made except with the approval of the Town of Smyrna. Buried valves shall have a two inch (2") square operating nut and extension stems shall be provided as required to bring the operating nut to within thirty inches (30") of the finished ground surface.

Provide and use tools and facilities that are satisfactory to the Town of Smyrna and that will allow the work to be done in a safe and convenient manner. All pipe, fittings, valves, and hydrants are to be unloaded from the trucks using suitable tools and equipment. Use a derrick, ropes, or other suitable tools or equipment to lower all pipe, fittings, valves, and hydrants into the trench one piece at a time. Lower each piece carefully so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances drop or dump water line materials into the trench.

Any pipes strung out along the route (for those days of installation work only) before the actual installation is due to take place shall not be lowered into the trench until they have been swabbed and thoroughly cleaned to remove any mud, debris, etc., that may have accumulated within them. PVC pipe shall be strung out a maximum of one day ahead of pipe installation. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell, and leave dry and oil-free.

Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside, then put a heavy, tightly woven canvas bag of suitable size over each end of the pipe, and leave in place until it is time to connect that pipe to the one adjacent to it.

Place no debris, tools, clothing, or other materials in the pipe during laying operations.

After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and then insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.

Bell holes shall be big enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so that each pipe barrel will rest on a solid foundation for its entire length.

Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the Town of Smyrna. If the joints of any pipe in the trench cannot be completed until a later time, caulk them with packing in order to make them as watertight as possible; this shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.

Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.

Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the Town of Smyrna.

Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed 1%, nor that recommended by the pipe manufacturer, and shall be approved by the Town of Smyrna.

Lay no pipe in water or when it is the Town of Smyrna’s representative’s opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project, and no separate payment will be made for its use.

Where a water line crosses over a sanitary sewer, use a full joint of pipe with a standard mechanical joint, and center over the sewer. A minimum 18-inch vertical separation from the bottom of the water line to the top of the sewer line shall be maintained. Where a water line is to be parallel to a sanitary or storm sewer, lay it at least 10 feet from the sewer line edge to edge. If it is not practical for the water and sewer lines to be separated as described above, then lay the water line with a ductile iron joint centered over the sewer line and as described in Section 1, Water Line Additions.

Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.

When PVC pipe is installed, for detection purposes, a 12 AWG solid (braided and strand is not allowed) copper tracing wire (shielded) shall be duct taped to the top of the water line pipe at both ends and at the middle of each segment. Connections between wires shall be connected with a water tight wire nut fasteners (Example: Dryconn) and wrapped. The ends of the wire shall terminate from the main to meter. The wire shall have a minimum of 24-in. inside the meter box. The copper tracing wire should be routed to the end of the service, and it should end two feet (2 ft.) above grade. At the end of the service line, it shall be marked by a marker pole. When installing a fire hydrant, the end of the copper tracing wire shall terminate within the valve box, and it shall be extended to the top of the valve box lid. An approved metallic tape identified as "water" and shall be installed as per the manufacturer's instructions. Bury the metallic tape 12 inches below the subgrade. Waterline bury tape shall be laid on top of the waterline's gravel envelope.

When coupling ductile iron pipe with PVC C900 pipe, a Tyler coupling sleeve of the correct size or approved equal shall be used.

6.04 **INSTALLING FIRE HYDRANTS** - Locate hydrants as shown on the drawings or as directed by the Town and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians.

All hydrants shall stand plumb. Set hydrants to the established grade, with nozzles at least 18 inches above the ground, as shown on the drawings or as directed by the Town of Smyrna.

Connect each hydrant to the main with a 6-inch ductile cast iron branch, as applicable, and a gate valve of the size indicated on the plans.

Provide drainage at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to a sewer.

The gate valve is to be rodded ahead of each hydrant to the tee, and rod the hydrant from the gate valve. Brace the bowl of each hydrant well against non-excavated earth at the end of the trench with concrete thrust blocking as indicated on the standard drawings. Where rods cannot be used, metal harnesses may be used. Metal harness is steel rods, or clamps shall be galvanized or otherwise rustproof treated as and shall be used only when approved by the Town of Smyrna. Self-restraining fittings will be allowed only in conjunction with concrete thrust blocking.

6.05 **THRUST BLOCKS & RESTRAINTS** - Poured in place concrete thrust blocks must be provided at all points of unbalanced pressure where the pipeline could pull apart. Thrust blocks shall conform to details and minimum bearing areas as shown on the drawings and shall bear against the undisturbed trench face. Contractors may elect to use an approved type of locked flexible joint extending on each side of bend as per standard drawings.

Where over bends (downward bends) cannot be avoided the fitting must be held in place by one of the following methods:

1. Poured concrete under a pipe of sufficient volume to counteract unbalanced force with steel clamp and anchor bolts to hold fitting to concrete as per standard drawings.

2. Approved type of locked flexible joint extending on each side of bend as per standard drawings.

When using all thread rods for restraint purposes, the number of rods used shall be a minimum of half the pipe's size (Ex. 8" water main will have four (4) all thread rods.) The all thread rods shall be used in conjunction with megalug joint restraints that are the same size as the pipe size that is being restrained. The all thread rods shall be stainless steel and/or have a coating to protect the rods from rusting.

AMOUNT OF ALL THREAD RODS PER PIPE SIZE

Pipe Size(s)	Number of Rods Needed
4"	2
6"	4
8"	4
10"	6
12"	6
14"	8
16"	8
18"	10
20"	10
24"	12
30"	16
36"	18
42"	22
48"	24

6.06 **VALVE BOX INSTALLATIONS** - Provide a valve box for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the Town of Smyrna. Valve boxes shall be "John Bouchard & Sons No. 8006".

Valve boxes shall be centered over the valve 2" operating nut and installed in a vertical position. Box shall be of the proper length to extend to the ground surface and allow the adjustable upper section to be positioned approximately midway between upper and lower limits. Backfill shall be carefully tamped around the valve box and suitable support shall be provided under and around the upper section to prevent future settlement.

6.07 **CONNECTIONS TO EXISTING MAINS** – No tap shall be made without approval from the Director of Utilities. The **CONTRACTOR** shall make connections to existing mains as shown on the drawings or described herein. Connections to existing mains presently in service shall be made with tapping sleeves and valves without taking the existing main out of service.

Where existing mains must be valved off to make connections, the **CONTRACTOR** shall notify the Water Department not less than twenty-four (24) hours prior to the making of the connection and the actual time of the service interruption shall be subject to approval by the **TOWN OF SMYRNA**.

The **CONTRACTOR** shall make his own arrangements for use of a tapping machine.

The service line shall have a minimum of 18 inches cover. After the line is installed and the yoke set, turn water on the service pipe between yoke and main, blowing any accumulated trash out of the pipe.

In general, install the meter box as near the property lines as possible near the street right-of-way. Set plumb approximately 1 inch above the existing or proposed grade and as to insure surface drainage will not enter the box. Fill from the existing or proposed grade to the top of the meter box at a slope of 1 inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the Town of Smyrna. The service main shall not be taut from stop to cock. Set the yoke plumb and level.

It shall be the responsibility of the **CONTRACTOR** to measure outside diameters of existing pipes before ordering tapping sleeves, or other fittings intended for connecting to existing mains.

The **CONTRACTOR** shall make connection with existing 12 AWG gauge solid copper tracer wire with the King Innovation Dryconn waterproof connectors. The Dryconn waterproof connector shall be blue (part number 90220).

6.08 **SERVICES AND SERVICE RELOCATIONS** - Services shall be installed as indicated on drawings and at locations as directed by **ENGINEER**. The **CONTRACTOR** shall furnish and install minimum 2" Schedule 40 PVC casing pipe for service lines that cross under streets. Schedule 40 PVC casings shall be installed before road base stone is applied and excavation for casing shall be backfilled with crushed stone to the full depth. Care shall be taken to maintain minimum cover over the service line, including ditch line crossings as shown on drawings. All service line casing crossings of paved roads shall be installed by boring and jacking. The cost of the PVC casing pipe and the boring of the casing pipe shall be included in the cost of the service pipe

6.09 **PROTECTION OF PIPE** - Whenever pipe laying operations are suspended for any reason, including lunch hour or temporary interruptions, a test plug shall be inserted in the open ends of the pipe.

The installed pipe shall be adequately protected at all times against the entrance of dirt, animals, mud, sewage or other foreign material. Pipe shall not be laid in a ditch containing standing water.

SECTION 7 - TESTING AND DISINFECTION - WATER MAINS

7.01 **GENERAL** - Upon completion of the construction work under this contract all water lines shall be disinfected and subjected to the necessary pressure and leakage tests. The allowable leakage shall be calculated by AWWA standards L=(SDvP)/148,000 or alternatively, L=(SDvP)/133,200. In the event the pressure or leakage test is unsatisfactory, or bacteriological tests indicate that disinfection is incomplete, corrective measures shall be taken and the tests repeated until satisfactory results are obtained.

7.02 **HYDROSTATIC TESTS**

A. PRESSURE TEST

After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main.

The duration of each pressure test shall be at least two hours.

Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the Town of Smyrna. The **CONTRACTOR** shall furnish the pump, pipe, connections, gauges, and all necessary apparatus for pressure testing.

Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.

Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the Town of Smyrna.

7.03 **DISINFECTION**

A. BASIC DISINFECTION PROCEDURE FOR NEW WATER MAINS

The basic disinfection procedure consists of the following:

1. Inspecting materials to be used to ensure their integrity.

2. Preventing contaminating materials from entering the water main during storage, construction, and/or repair and noting potential contamination at the construction site.

3. Removing, by flushing or other means, those materials that may have entered the water main and/or appurtenances.

4. Preventing contamination of existing water mains from cross-connection during flushing, pressure testing, and disinfection.

5. Pressure testing the water main to ensure the main meets the purchaser's allowable leakage rate. Hydrostatic pressure tests should be conducted with potable water.

6. Chlorinating and adequately documenting the process used for disinfection.

7. Flushing the chlorinated water from the main. Refer to ANSI/AWWA C655 Field Dechlorination for dechlorinating procedures if dechlorinating is required.

8. Determining the bacteriological quality of water samples collected from the pipe by laboratory test after disinfection.

9. Final connecting of the newly disinfected water main to the active distribution system without sacrificing sanitary practices and conditions.

The use of 65% granular calcium hypochlorite conforming to NSF/ ANSI/ AWWA B300 and 12% bleach are the only forms of chlorination authorized by the Town of Smyrna.

B. PREVENTIVE AND CORRECTIVE MEASURES DURING NEW CONSTRUCTION

General. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing these organisms. Therefore, the procedures of this section must be observed to ensure that a water main and its appurtenances have been thoroughly cleaned for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system before the receipt of satisfactory bacteriological samples may constitute a cross-connection. Therefore, the new main must be isolated until bacteriological tests described in this specification are satisfactorily completed.

Keeping pipes **clean and dry.** The interiors of pipes, fittings, and valves shall be protected from contamination.

Openings in pipelines. Openings in the pipeline shall be closed with water-tight plugs when pipe installation has stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

Stringing pipes. Pipes delivered for construction shall be strung to minimize the entrance of foreign material.

Delays. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

Joints. Joints of pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is free of standing water and mud that may enter the pipe.

Packing materials. Yarning or packing material shall consist of molded or tubular rubber rings, rope of treated paper, or other approved materials. Materials such as jute or hemp shall not be used. Packing material shall be handled in a manner that avoids contamination.

Sealing materials. No contaminated material or any material capable of supporting growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water meeting the requirements of NSF/ANSI 61 and shall not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated clean applicators.

Cleaning and swabbing. If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a minimum 1 percent free chlorine disinfecting solution. If, in the opinion of the purchaser, the dirt remaining in the pipe will not be removed using the flushing operation, the interior of the pipe shall be cleaned using mechanical means, such as a hydraulically propelled foam pig (or other suitable device acceptable to the purchaser) in conjunction with the application of a minimum 1 percent free chlorine disinfecting solution. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the purchaser.

Wet-trench construction. If it is not possible to keep the pipe and fittings dry during installation, a scour flush at 2.5 ft/sec or greater for a minimum of three pipe volumes (see Table II) followed by slug or continuous-feed chlorination and bacteria testing before release is required. For larger mains, pigging or other suitable method acceptable to the purchaser is an option in place of high-velocity flushing.

Flooding by storm or accident during construction. If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with a chlorinated potable water that, at the end of a 24-hr holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. If chemical contamination occurs, such as a hydraulic oil leak or petroleum product spill, the pipe sections exposed to the contamination should be replaced and not reused for potable water applications. After construction is completed, the main shall be disinfected using the continuous-feed, slug, or spray methods.

Backflow protection. The new water main shall be kept isolated from the active distribution system using a physical separation until satisfactory bacteriological testing has been completed and the disinfection water flushed out. Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the distribution system and the new main or other supply source approved by the purchaser. The temporary connection shall include a reduced pressure backflow preventer and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to reestablish the temporary connection after completion of the hydrostatic pressure test to flush out the disinfectant water prior to final connection of the new main to the distribution system. Note: Exposure to high levels of chlorine or high pH can cause

severe irritation to customers. Also, the chlorinated water can be high in disinfection by-products.

If dirt or other foreign material that has gotten into a pipe will not, in the opinion of the Town of Smyrna, be removed by flushing, clean the interior of the pipe, and swab with a disinfecting solution of 5% hypochlorite.

Placement of calcium hypochlorite granules during construction.
Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft (150-m) intervals. The quantity of granules at each location shall be as shown in Table 1.

Make water flow from the existing distribution system or some other source approved by the A/E into the newly-laid/proposed pipeline shall have a reduce pressure backflow preventer on the existing water main to fill the newly-laid/proposed water main. The newly-installed/proposed water main shall be disinfected to a minimum of 50mg/L of available chlorine. If this is not obtain, then continuous chlorinated water into the new water main with a 24 hour detention of no less than 50 ppm, which is the preferred method for new lines. To ensure that this concentration is maintained, measure the chlorine residual at regular intervals.

Filling and contact time. When installation has been completed, the main shall be filled with water such that the velocity is no greater than 1 ft/sec (0.3 m/sec). Fill rate must be carefully controlled to ensure granules do not get flushed to the very end of the pipe. Precautions shall be taken to ensure that air pockets are eliminated. Water used to fill the new main shall be supplied through a temporary connection and shall include an appropriate cross-connection control device.

Continuous-Feed Method of Chlorination. The continuous-feed method consists of completely filling the main with potable water, removing air pockets, then flushing the completed main to remove particulates, and refilling the main with potable water that has been chlorinated to 25 mg/L. After a 24-hr holding period in the main there shall be a free chlorine residual of not less than 10 mg/L

Preliminary flushing. Piping shall be filled with potable water to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec unless the purchaser determines that conditions do not permit the required flow to be discharged to waste. Table II shows the rates of flow required to produce a velocity of 2.5 ft/sec in commonly used sizes of pipe. (Note: flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity. Pigging of the main, or other suitable method acceptable to the purchaser, may be required.) Where such flow rates are not possible, flushing at the maximum expected flow rate for the line for 2–3 volumes may be acceptable. For larger mains, pigging (or other suitable method acceptable to the purchaser) is an option in place of high velocity flushing.

For 24-in. (600-mm) or larger diameter mains, an acceptable alternative to flushing is to broom-sweep the main, carefully removing sweepings prior to filling and chlorinating the main. Warning: OSHA requirements for confined space need to be addressed before entering a pipeline. Refer to AWWA standard C651 for additional information.

C. PROCEDURE FOR CHLORINATING WATER MAINS

The procedures for chlorinating water mains are as followed:

1. Potable water shall be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, or measuring the time to fill a container of known volume. The main should undergo hydrostatic testing prior to disinfection.

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To ensure that an appropriate concentration is achieved, the free chlorine concentration shall be measured at regular time intervals in accordance with the procedures described in Standard Methods for the Examination of Water and Wastewater or AWWA Manual M12, or using appropriate chlorine test kit.

TABLE I
WEIGHT OF CALCIUM HYPOCHLORITE GRANULES TO BE PLACED AT THE BEGINNING OF A WATER MAIN AND AT EACH 500-ft (150 m) INTERVALS FOR THE MINIMUM CONCENTRATION OF 50 mg/L.

Pipe Diameter (d)		Calcium Hypochlorite Granules	
in.	(mm)	oz	(g)
4	(100)	3.4	(97)
6	(150)	7.6	(216)
8	(200)	13.4	(380)
10	(250)	21	(596)
12	(300)	30.2	(857)
14 & larger	(350 & larger)	D2 × 30.2	D2 × 857

*Where D is the inside pipe diameter, in feet D = d/12

D. FINAL FLUSHING FOR NEW WATER MAINS

Clearing the main of heavily chlorinated water. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

Disposing of heavily chlorinated water. The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine

(see ANSI/AWWA C655 for neutralizing chemicals). Where necessary, federal, state, local, or provincial regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Final connections to existing water mains. Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection so that there is no contamination of the new or existing water main with foreign material or groundwater.

Connections to existing water mains shall equal to or less than one pipe length (generally less than or equal to 20 ft). The new pipe, fittings, and valve(s) required for the connection may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just before being installed if the total length of the connection from the end of a new main to the existing main is equal to or less than 20 ft. (6 m).

E. NEW WATER LINE DISINFECTION AND SAMPLING PROCEDURES[1]

New water line disinfection procedures are conducted following a modified version of the AWWA Standard for Disinfecting Water Mains C651 and the bacteriological sampling procedure is conducted in accordance with Division Rule 0400-45-.17(8)(b). Continuous feed method with 25 mg/L and a 24-hour detention time of no less than 10 mg/L is the preferred method for new water lines. A detailed summary of the new water line including any calculations must be documented and maintained (Appendix 1 in the Bacteriological Monitoring Sample Site Plan or the Water Line Inspection Report for New and Repaired Lines for dosage calculations depending on line size, length and proper conversions). **New line samples shall be coded as "N" samples and reported on the "Bacteria Detailed "sheet on the state report. In the event where a contractor, engineer, inspector or consultant does not provide the system with documentation of adequate disinfection, the Smyrna water system will refuse to activate the water line until the contractor provides evidence needed to document adequate disinfection.**

1. The use of 65% granular calcium hypochlorite conforming to NSF/ ANSI/ AWWA B300 and 12% bleach are the only forms of chlorination authorized for new lines by the Town of Smyrna. Due to the slow dissolving nature of tablet chlorination it has been determined not to be a practical option for repaired or new water lines and is prohibited. **Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate from the pipe. The use of any chlorine mixture that contains pesticides or algaecides is prohibited.**

2. As an optional procedure (if specified), water used to fill the new main shall be supplied through a temporary connection that includes an appropriate cross-connection control device. **These temporary connections shall be adequately sized to achieve 2.5 fps (feet per second) for proper flushing as stated in Table II of this section.**

3. After the required chlorination holding time is met. A final flush should be conducted until discolored water is eliminated and the chlorine concentration in the water exiting the

main is no higher than the prevailing water in the distribution system or that which is acceptable for domestic use. Proper neutralization procedures for de-chlorination must be followed according to AWWA, federal, state, provincial or local regulatory agencies using appropriate reducing agents to minimize environmental impact. (AWWA C655, Disposal of Heavily Chlorinated Water)

4. After the final flush, the main is to be valved off and isolated from the distribution system. After at least 48 hours of isolation one set of bacteriological samples are to be collected. Samples will be collected at approximately 2,500-foot intervals with samples near the beginning and end points and at least one sample from each branch unless alternate sampling frequency and distance between each sampling point approval has been obtained by the state. Additional samples, representing the water from any contaminated area, are to be collected if sanitary conditions were not maintained before, during or after construction. Unsanitary conditions include failure to document the sanitary handling of materials, to conduct construction inspections and to maintain records, and to document sanitary practices during construction and other hazards such as trench flooding during construction. **A new line will not be put into service until negative (acceptable) results for all samples are achieved.**

5. **If the constructed facility yields positive bacterial samples, IT MUST BE flushed; disinfected and bacteriological sampling shall be repeated until the water is coliform free.** New line sampling should also consist of additional chemical and bacteriological analyses such as turbidity, pH, chlorine and a standard heterotrophic plate count because new material does not typically contain coliforms but does typically contain HPC bacteria (AWWA C651 Section 5.1.1.4). HPC samples that result in anything above 38 positive wells, which corresponds to >100 CFU/mL and 10.0 MPN for IDEXX SimPlate, will be re-flushed and monitored on a regular basis. This parameter is used for our reference as an indicator of the microbial presence in the new line. *For additional information refer to AWWA, M48 Waterborne Pathogens, Heterotrophic Bacteria and AWWA C651 Section 5.1.

6. The Smyrna water system will notify the state if one-half or more of the samples collected in accordance with 0400-45-01-.17(8)(c) are “positive.”

   List of Codes for New Water Lines:

   N – New Water Line Samples

   The velocity of the water used to flush a line shall be at least 2.5 fps. The flow rates required to produce this velocity in various sizes of pipe are shown in Table II.

TABLE II
REQUIRED OPENINGS TO FLUSH PIPELINES
(40 PSI RESIDUAL PRESSURE)

Pipe Size (Inches)	Flow Required to Produce 2.5 fps Velocity (gpm)	Orifice Size (Inches)	Hydrant Outlet Nozzles	
			Number	Size (Inches)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
14	1,200	3-1/42	2	2-1/2
16	1,565	3-5/8	2	2-1/2
18	1,980	4-3/16	2	2-1/2
20	2,440	---	2	2-1/2
24	3,470	---	2	2-1/2

Once a line has been flushed, test to make certain that the residual chlorine in the water is within acceptable limits.

It must be noted that flushing is not a substitute for taking preventative measures before and during the laying of water lines. Certain contaminants--especially those in caked deposits--are difficult or even impossible to remove by flushing, no matter how high the velocity. Further-more, in pipes with diameters of 16 inches or more, it can be difficult to achieve even the minimum recommended flushing velocity of 2.5 fps.

F. DISINFECTION PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING WATER LINES (Refer to WTP Disinfection SOP located in the WTP Bacteriological Monitoring plan.)

The purpose of this SOP is to maintain the integrity of all water lines in the Smyrna Water System. The primary disinfectant is 65% calcium hypochlorite (HTH) that is NSF or ANSI approved for use in drinking water according to AWWA standards. **Chlorine that is intended for use in pools and spas containing algaecides and other additives is strictly prohibited.**

The following procedures will be conducted for line repairs:

Repairs made with the water lines pressurized:

1. Valve-off the line downstream from the leak.

2. Reduce the flow upstream from the leak but allow enough flow to maintain a positive pressure at the leak site.

3. Remove cover from the line at the leak to a depth approximately 18 inches lower than the line. Excess water shall be pumped or dipped from the trench until all cover is removed 360 degrees from the pipe at the leak.

4. If the leak can be repaired with the proper repair fittings, the repair fittings are to be disinfected with a 1% hypochlorite solution by adding approximately 2 oz. of 65% HTH or 1 quart of 5% bleach to 1 gallon of water. After the repairs are made, the service will be restored. No further action will be taken.

Repairs that require the line be cut and a section replaced:

NOTE: STEPS 1 THROUGH 4 FROM THE PREVIOUS PROCEDURE SHOULD BE FOLLOWED BEFORE STARTING WITH STEP 1 OF THIS PROCEDURE.

5. Upstream and downstream valves will need to be closed and excess water will continue to be pumped from the leak site while removing all cover from around the pipe at least 18 inches in both directions from the cut sites on the pipe.

6. A 1% hypochlorite solution will be prepared by adding approximately 2 oz. of 65% HTH or 1 quart of 5% bleach to 1 gallon of water.

7. The surrounding area will be checked for signs of sewage, septic lines and/or animal waste. If present, special care must be taken and some of the 1% hypochlorite solution should be sprayed or HTH scattered around the work site.

8. Work can now proceed by cutting the pipe. Once the defective section is removed, both ends of the remaining pipe should be checked and any debris from pipe cutting or other sources should be removed.

9. The new section of and both ends of the remaining pipe should be swabbed with the 1% hypochlorite solution and repairs completed.

10. Upstream valves will be opened and the nearest flushing site (fire hydrant, blow-off or tap) downstream from the repair site will be opened. The minimum time (seconds) required to flush the line will be determined by dividing the estimated distance (feet) between the upstream valve and the nearest flushing site by two. Example (if the flushing point is 3000ft. from the leak site the line should be flushed a minimum of 1500 seconds or 25 minutes.) A second option, which can be used to determine the time needed to flush each site, would be to estimate the distance from the line break to the nearest hydrant. Flushing time would be determined by line size and flow based on the system's hydrant color-coding system. Flushing shall continue until chlorine residual readings are equal at the flushing site and at a site upstream from the line repair. In addition, flushing shall continue until turbid water is no longer visible at the flushing site and all air will be flushed from service lines in the area between the closed valves.

11. After the line is flushed at least **two bacteria samples** shall be collected immediately prior to service being restored. One sample must be taken upstream of the repair and one sample must be taken downstream of the repair. **This sample shall be coded as type "DP".** If the sample is "negative" no further action is required other than to properly and fully document the repair event and procedures. If the sample is "positive" then the original positive site will be re-sampled and 2 additional repeat samples will be collected within 5 service connections upstream and downstream of the original "positive" location within 24 hours of notification of the positive sample. **The original site will be coded as "R" and each of the upstream and downstream samples will be coded as "R", repeat distribution samples, and will be counted as compliance samples.** The Smyrna water system will notify the state if one-half or more of the samples collected in accordance with 0400-45-01-.17(8)(c)1 are "positive."

12. If all 3 samples are "negative", no further action will be taken. If one or more repeat samples in the set are total coliform-positive, the public water system must collect an additional set of repeat samples. The additional samples must be collected within 24 hours of being notified of the positive result. The system must continue repeat sampling until total coliforms are not detected in one complete set of repeat samples. When the system determines that the MCL for total coliforms has been exceeded, immediately notify the State. If any of the downstream samples are "positive", normal repeat monitoring procedures become effective. If any repeat sample is fecal coliform positive or E. coli positive or if the repeat sample following an initial positive fecal coliform or E. coli sample is total coliform positive, the system must issue a Tier-1 Boil Water Notice.

G. Slug Disinfection

If it is suspected that the line may have had contaminants enter the line, slug disinfection shall be employed to disinfect the line. Slug disinfection consists of putting HTH in a line, completely filling the line with water and slowly flowing the slug of water through the line. This will be accomplished by adding enough chlorine to achieve 300 ppm for a holding time of 15 minutes **(See Appendix 1 in the Bacteriological Monitoring Sample Site Plan for dosage calculations depending on line size, length and proper conversions).** If the suspected contaminant is not affected by chlorine, alternative measures must be employed to remove the contamination.

1. All meters in the area between the closed valves are to be shut off before slug disinfection.

2. The line shall be disinfected from closed valve to closed valve at 300 ppm for 15 minutes.

3. After the holding time is complete, flushing shall continue until chlorine residual readings are equal at the flushing site and at a site upstream from the line repair. In addition, flushing shall continue until turbid water is no longer visible at the flushing site.

4. Proper neutralization procedures for de-chlorination must be followed according to AWWA, federal, state, provincial or local regulatory agencies using appropriate

reducing agents to minimize environmental impact. (AWWA C655, Disposal of Heavily Chlorinated Water)

5. All service lines in the area between the valves that were closed during the repair are to be flushed by first opening the outside faucet then opening the meter to flush out any highly chlorinated water from the service lines to the residence or business.

6. Service lines of one and three-quarter inch diameter or less will not have any samples taken or additional disinfectant added. The leak will be clamped off to prevent any contamination from entering the main line. The service line will be flushed and chlorine residual will be taken. Lines two-inches and larger in diameter will be treated as a water main.

7. For any repair procedure, detailed records of the repair must be prepared documenting the procedure utilized, disinfection information, contact time, dose calculations, bacteriological sample time and location. Bacteriological sample results shall be attached to corresponding repair records.

8. **BE SURE TO DOCUMENT ALL STEPS TAKEN TO REPAIR WATER MAINS IN DETAIL FOR RECORD KEEPING PURPOSES.**
   Refer to attached SDS for Calcium Hypochlorite for health hazards/effects of exposure information, proper protective equipment, chemical properties, and spill and leak procedures.

   List of Codes for Repaired Lines:

   DP – Distribution Samples
   R – Repeat Samples

7.04 BACTERIOLOGICAL TESTS

1. After a water line has undergone final flushing but before it is placed into service, collect a sample for bacteriological testing according to Step 4 of the New Line Disinfection and Sampling Procedure for new lines and Steps 11 and 12.

2. Collect these samples in sterile bottles treated with sodium thiosulfate. **Do not use a hose to collect samples**. Contact the Utilities Department's construction inspectors and/or WTP lab staff for proper collection sample points on proposed and/or tested water mains. One suggested sampling method is to install a standard corporation cock in the line with a copper tube gooseneck assembly; after the samples have been taken, the gooseneck assembly can be removed and retained for later use.

3. All bacteriological samples are to be collected and tested by the Town of Smyrna Water Treatment Plant Laboratory. If the initial disinfection fails to produce satisfactory samples, repeat disinfection until satisfactory samples are obtained as listed in Step 5 of the New Line Disinfection and Sampling Procedures for new lines and Step 12 of the Disinfection Procedure after Cutting into or Repairing Existing Lines for repaired lines.

4. When the samples tested are found to be satisfactory, the water line may be placed in service.

SECTION 8 - SPECIAL CONDITIONS

8.01 **GENERAL** - The **CONTRACTOR'S** attention is called to the special conditions indicated on the plans and described in this section of the specifications. Special conditions include construction on highway or railroad right-of-way, construction in the vicinity of existing utilities, and special surface restoration.

8.02 **WORK ON HIGHWAY RIGHT-OF-WAY** - The **CONTRACTOR** shall be responsible for complying with the requirements of the appropriate Highway Department. In the event a surety bond is required, such bond will be provided by the **CONTRACTOR**.

8.03 **WORK ON RAILROAD RIGHT-OF-WAY** - Should it be necessary to do any excavation or trenching on railroad rights-of-ways, the **CONTRACTOR** shall notify the railroad and shall conform to their requirements when performing work on their rights-of-way.

8.04 **COORDINATION WITH OTHER UTILITIES** - The **CONTRACTOR** shall cooperate with other utilities and shall take every reasonable precaution to avoid conflicts. In instances where the proposed water lines will be located near existing or proposed utility lines, the **CONTRACTOR** shall take the necessary steps to avoid damage to the utility lines and shall notify the **TOWN** of any potentially hazardous situations.

8.05 **SEEDING** - In all areas damaged or disturbed by **CONTRACTOR'S** operations where established ground cover was present before beginning of construction, **CONTRACTOR** shall be responsible for restoring this ground cover after completion of construction (unless noted otherwise on drawings). In areas of established lawns, **CONTRACTOR** will be required to: separate and preserve best of excavated material or, if no acceptable material has been excavated, haul in an acceptable material for use in making top six inches (6") of finished grade. No rock will be permitted in the top six inches (6") of finished grade for established lawns. All areas seeded shall be graded smooth prior to seeding and **CONTRACTOR** shall be responsible for maintenance of this smooth finished grade until grass growth is established.

After designated areas have been carefully hand graded, soil shall be prepared for seeding. Where necessary, **CONTRACTOR** will sod slopes and embankments, and remaining areas may be seeded.

A well-made lawn is desired, and **CONTRACTOR** will be responsible for any necessary regarding or reseeding required to produce an acceptable grass as cover. The seed is to be of the same type of grass existing before construction.

The soil shall be fertilized with a commercial fertilizer of a grade and at a rate recommended by the vendor of seed.

All seeded areas shall be covered with clean straw uniformly distributed to the approved density.

8.06 **CASING PIPE** - Is intended to be installed by bore and jack. Installation may be made by open cut only if authorized in writing by the **TOWN OF SMYRNA**, and generally only after an attempted bore is unsuccessful. In no event will the construction method be contradictory to instructions of the Railroad or Highway Department. In the event of any unsuccessful bore attempts, the bore hole will be refilled according to instructions of the

Railroad or Highway Department or outside their jurisdiction by leaving jacked casing in place and sealing the end with brick and mortar.

8.07 **SERVICE RELOCATIONS** - The service relocations shall consist of installing a new service line from the proposed main to the new meter setting on the existing customer service line as directed by the **TOWN**. All existing service regulators or control devices on the existing customer line shall be relocated. The **CONTRACTOR** shall be responsible for lowering customer service lines to depths as necessary for proper connection. The **CONTRACTOR** shall furnish a new corporation stop, yoke and meter box at each location. All service line installation shall be installed as delineated herein.

8.08 **SLOPE PROTECTION AND EROSION CONTROL**

A. **General**

This section shall consist of temporary control measures as shown in the Plans or directed by the **ENGINEER** during the life of the Contract to control erosion and water pollution through the use of berms, dikes, dams, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices.

The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features to assure economical effective and continuous erosion control throughout the construction and post-construction period.

B. **Materials**

1. **Temporary Berms:**

A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

2. **Temporary Slope Drains**

A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, sod or other material acceptable to the **ENGINEER** that may be used to carry water down slopes to reduce erosion.

3. **Sediment Structures**

Sediment basins, ponds and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

4. **Check Dams**

(a). Check dams are barriers composed of logs and poles, large stones or other materials placed across a natural or constructed drain way.

(b). Stone check dams shall not be utilized where the drainage area exceeds fifty (50) acres. Log and pole structures shall not be used where the drainage area exceeds five (5) acres.

5. **Temporary Seeding and Mulching**

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.

6. **Brush Barriers**

a. Brush barriers shall consist of brush, tree trimmings, shrubs, plants and other approved refuse from the clearing and grubbing operations.

b. Brush barriers are placed on natural ground at the bottom of all slopes where the most likely erodible areas are located to restrain sedimentation particles.

7. **Temporary Silt Fences**

Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

C. **Execution**

1. **Project Review**

Prior to the Pre-Construction Meeting the **CONTRACTOR** shall meet with the **ENGINEER** and go over in detail the expected problem areas in regard to the erosion control work. Different solutions should be discussed so that the best method might be determined. It is the basic responsibility of the **CONTRACTOR** to develop an erosion control plan acceptable to the **ENGINEER**.

2. **Pre-Construction Meeting**

At the Pre-Construction Meeting the **CONTRACTOR** shall submit for acceptable his schedule for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, bridges and other structures at watercourses, construction and paving.

He shall also submit for acceptance his proposed method of erosion control on haul roads and borrow pits and his plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the **ENGINEER**.

3. **Construction Requirements**

a. The **ENGINEER** has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the **CONTRACTOR** to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent directed by the **ENGINEER**.

b. The **CONTRACTOR** shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall not be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

c. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing exceed 750,000 square feet without the approval of the **ENGINEER**.

d. The **ENGINEER** will limit the area of excavation, borrow and embankment operations in progress commensurate with the **CONTRACTOR'S** capability and progress in keeping the finish grading, mulching, seeding and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

e. Under no conditions shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the

project area exceed 750,000 square feet without prior approval by the **ENGINEER**.

f. The **ENGINEER** may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.

g. In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

4. **Construction of Structures**

a. **Sediment Structures**

1. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.

2. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

b. **Check Dams**

1. Check dams shall be utilized to retard stream flow and catch small sediment loads. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the **CONTRACTOR'S** erosion control plan.

2. All check dams shall be keyed into the sides and bottom of the channel a minimum depth of two feet (2'). A design is not needed for check dams but some typical designs are shown in the standard plans.

3. Stone check dams should generally not be utilized where the drainage area exceeds fifty (50) acres. Log and pole structures should generally not be used where the drainage area exceeds five (5) acres.

c. **Temporary Seeding and Mulching**

Seeding and mulching shall be performed in accordance with

Section 8, Seeding.

d. **Brush Barriers**

Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operations. The brush barriers shall be constructed approximately parallel to the original ground contour. The brush barrier shall be compressed to an approximate height of three (3) to five (5) feet and approximate width of five (5) to ten (10) feet. The embankment shall not be supported by the construction of brush barriers.

e. **Temporary Silt Fences**

1. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.

2. The **CONTRACTOR** shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the **ENGINEER**. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the **ENGINEER**. The silt fence becomes the property of the **CONTRACTOR** whenever the fence is removed.

D. **Maintenance**

a. The temporary erosion control features installed by the **CONTRACTOR** shall be acceptably maintained by the **CONTRACTOR** until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the **CONTRACTOR**.

b. In the event that temporary erosion and pollution control measures are required due to the **CONTRACTOR'S** negligence, carelessness or failure to install permanent controls as a part of work as scheduled, and are ordered by the **ENGINEER**, such work shall be performed by the **CONTRACTOR** at his own expense.

c. Where the work to be performed is not attributed to the **CONTRACTOR'S** negligence, carelessness, or failure to install permanent controls and falls within the specifications for a work item that has a contract price, the units of work shall be paid for at the proper contract prices.

E. **Erosion Control Outside of Project Area**

Temporary pollution control shall include construction work outside the project

area where such work is necessary as a result of construction such as borrow pit operations, haul roads and equipment storage sites. Bid price in such cases shall include all necessary clearing and grubbing, construction incidentals, maintenance and site restoration when no longer needed.

F. **Measurement and Payment**

No separate Measurement and Payment will be made for this work. It will be considered a subsidiary obligation of the **CONTRACTOR** under other bid items to which it relates.

8.09 **VIDEO** - Prior to construction, **CONTRACTOR** shall color videotape the entire project including the route of the line construction, all easement areas, the full width of all rights-of-ways, and all service line areas. The **CONTRACTOR** shall identify the line designation and station number, all natural landmarks, the street address of the area in view and all potential areas, structures, fences, trees, etc., subject to potential disturbance. The **CONTRACTOR** shall provide the **OWNER** with two (2) copies of the video with audio comments.

8.10 **WATER PRESSURE REDUCING VALVE** - If a water pressure reducing valve is to be used, then it shall be a Watts pressure reducing valve or an approved equal. Each pressure reducing valve shall have a bypass. The minimum size of the bypass to be used will be a 2" bypass. The water pressure reducing valve must be in the ground inside of a vault. The vault must have a lockable hatch door(s) for access.

8.11 **INLINE INSERTION WATER VALVE** – Inline insertion valve shall be installed with a hot tapping machine in conjunction with a temporary gate valve. The outer diameter of the water main that is to be tapped shall be measured with pipe outer diameter measuring tape before any installation is to begin. When tapping the water main, a coupon shall be retained to not leave any material(s) in the water main. The installation valve saddle attached to the water main shall be hydrostatically tested 200 psi for two (2) hours.

8.12 **WATER VALVE LOCATION** - Water valves shall be installed every 500 ft. on water mains. If the water valves need to be installed at a lesser or a greater distance, then the Town's engineer and/or utilities department will make that distinction. At each intersection of streets/roads, a valve should be installed in each direction of a water main crossing.

8.13 **BLOWOFF HYDRANT** - Blowoff hydrants shall be installed at the end of a water main with a valve. The valve shall be the same size as the water. It is to be used for future development of proposed water mains. If it is located in the construction plans that the water line does not continue (Example: such as a cul-de-sac), then a fire hydrant with a valve shall be installed. Blowoffs shall be installed in a green space and/or unpaved area. It shall be a 2 ½ in. M&H Model 33 post hydrant, (above ground blowoff) Kupferle Model 77, (below ground blowoffs) Kupferle Model 78, or an approved equal. Blowoffs that are below ground shall be housed in a Sigma meter box. The box part number is Sigma RMB-173018-SW, and the lid part number is Sigma RMB-1730-L-RT. If it is in a paved area, then a concrete valve box with a traffic rated lid shall be used instead. On top of the lid the word "WATER" shall be imprinted on it.

8.13 **FIRE HYDRANT METERS & CONSTRUCTION SITE WATER USAGE** - The Town of Smyrna Ordinance 18-124 states that "the Town of Smyrna **will not** render or cause to be rendered any free water and/or sewer services of any nature, nor will any preferential rates be established for users of the same class". **Therefore, the Town of Smyrna does not provide "free" domestic/potable water and/or reclaim/reuse water.**

If water is needed for a construction site, then the **CONTRACTOR** shall obtain a hydrant meter from the Town. Hydrant meters are **only** for a **CONTRACTOR'S** construction use **only.** On a commercial construction site(s), hydrant meters shall be used when water is needed for construction purposes on a construction site. The meter can be obtained by visiting the Smyrna Utilities Department and going through the proper protocols to obtain a hydrant meter. On a subdivision construction site(s), after the water main has been tested and accepted by the Town's Utilities Department, a water meter can be installed on a water service line. This water service can be used for construction purposes, and it shall be billed to the **CONTRACTOR and/or BUILDER.** This use of the water service for construction purposes **shall be done after the tap fees have been paid for on the project.** Using water from a water service tap without paying tap fees and having a meter set will incur a tampering fee, and shall be billed to the **CONTRACTOR and/or BUILDER.**

SECTION 9 - WARRANTY AND MAINTENANCE OBLIGATIONS

9.01 **WARRANTY** - The work to be performed under this contract shall be guaranteed against defects in materials or workmanship for a period of one year following the date of formal acceptance of the project. In the event defects in materials or workmanship should appear, the **CONTRACTOR** shall promptly make the necessary corrections. When the defects are not of an emergency nature, the **CONTRACTOR** will be notified and will be given a period of two weeks in which to make the necessary corrections. Should the defects be of an emergency nature, which in the opinion of the **TOWN OF SMYRNA** requires immediate correction, the **CONTRACTOR** will be notified and requested to make the necessary repairs immediately. Should this be impractical or if the **CONTRACTOR** should fail to respond to the request for corrective action within the specified period, the **TOWN OF SMYRNA** may proceed to have the defects corrected and shall bill the **CONTRACTOR** for all charges in connection therewith, including labor, lost water, materials and equipment rental. Such charges may be deducted from amounts due the **CONTRACTOR** if any of the **CONTRACTOR'S** money has been withheld. In the event the **CONTRACTOR** fails, refuses or neglects to pay the **TOWN OF SMYRNA** the surety shall be liable for such charges.

9.02 **MAINTENANCE OBLIGATION** - The **CONTRACTOR** shall be fully responsible for maintenance of any and all portions of the work, which he performs under this contract for a period of 90 days. This maintenance obligation shall begin upon formal acceptance of the project and is intended to place a limit upon the **CONTRACTOR'S** responsibility for normal maintenance required for the routine operation of the system. This 90 day obligation shall not be construed as relieving the **CONTRACTOR** of the responsibility for maintenance or repair work resulting from defective materials or workmanship.

SECTION 10 - MEASUREMENT AND PAYMENT

10.01 GENERAL

The **CONTRACTOR** shall furnish all labor, tools, equipment, and materials to construct the proposed improvements complete as shown on the Plans and described in these specifications. The work shall be measured for payment in accordance with applicable provisions of these specifications and payment shall be made on the basis of the unit prices or lump sum prices bid. The sum of the payments for eligible pay items contained in the proposal form shall be the compensation to be paid for the completed project; provided however, that changes in the work covered by written change orders, properly executed may result in additions or deductions from the contract price.

The **CONTRACTOR'S** attention is called to the fact that although the pay items shown shall be the basis for establishing the contract price, the pay items do not necessarily reflect the total amount of work to be performed. The cost of incidental work such as clearing and grubbing, trenching, backfilling, testing, etc. which is necessary but which is not specifically listed as one of the pay items, shall be included in the prices bid for the eligible pay items to which the incidental work is most closely related.

10.02 WATER LINES

a. **Measurement** - Measurement for the length of pipe to be included for payment at the unit prices bid shall be the actual length laid in the trench measured along the centerline of the pipe and including the lengths of valves and fittings in the line. Measurement shall begin at the ends of existing pipes, valves or fittings to which the new pipe is connected or such other point as may be designated on the Plans.

b. **Payment** - Payment for installing only water pipe lines complete will be made at the contract unit price bid per linear foot for water pipe of the various sizes and classifications. Payment for installing water pipe shall constitute full compensation for trenching, rock excavation, crushed stone bedding and crushed stone backfill to 12" above pipe where rock excavation is encountered, installation, backfill, disinfecting and testing for the water line, together with other incidental and related work necessary for the completion of the water main installation except that fittings, valves, valve boxes, pavement replacement and such other items shall be paid for separately, if included as a pay item on the bid proposal.

10.03 FITTINGS

a. **Measurement** - Pipe fittings for cast iron, ductile iron, AC or PVC pipe will be measured for payment by multiplying the number of fittings in each classification by the standard weight of the fitting as shown in appropriate tables of ANSI specification A21.10, American Standard for Cast Iron Fittings 2" through 48" for water and other liquids. Weights of fittings shall be exclusive of gland, bolts, gaskets, or other appurtenances and shall be as shown in the above specification rather than actual invoice weights.

b. **Payment** - Payment for installing only pipe fittings complete in accordance with these specifications will be made on the basis of contract unit price bid per pound for pipe fittings (all fittings assumed to be cast iron for purpose of determining weight as noted above) and shall constitute compensation in full for installing the fittings together with all incidental and related work except as specifically covered by other pay items.

10.04 **VALVES**

a. **Measurement** - Valves will be measured by actual count of each size and type of valve installed in the completed system.

b. **Payment** - Payment for installing only valves of the various sizes and classifications, together with any necessary joint accessories, adapters, extension stems, or other required appurtenances, shall be made on the basis of the contract unit prices bid. Such payment shall constitute full compensation for installing the valves in full accordance with the Plans and Specifications.

10.05 **VALVE BOXES**

a. **Measurement** - Measurement of valve boxes for payment shall be made by actual count of valve boxes provided in the completed installation.

b. **Payment** - Payment for installing only valve boxes complete with lids, extensions, crushed stone and other appurtenances as required shall be based on the contract unit prices bid. Such payment shall constitute compensation in full for installing the valve boxes complete in full accordance with the Plans and Specifications.

10.06 **FIRE HYDRANTS**

a. **Measurement** - Measurement of fire hydrants for payment shall be made by actual count of fire hydrants provided in the completed installation.

b. **Payment** - Payment for installing fire hydrants completely shall be based on the contract unit prices bid. Such payment shall constitute compensation in full for installing the existing fire hydrant complete with the necessary barrel and stem extensions, concrete base and kicker and the required crushed stone for drainage.

10.07 **ROCK EXCAVATION**

Excavation is unclassified; therefore, separate measurement or payment will not be made.

10.08 **CLASS B CONCRETE**

a. **Measurement** - Class B concrete used in bracing pipe and fittings shall be measured for payment on the basis of the theoretical quantities required to provide the desired bearing area with a trench of the desired dimensions. The pay quantities for braces behind typical fittings shall be as per concrete thrust block detail. In the event the type of soil is such that the bearing area must be increased, an appropriate adjustment will be made in the pay quantities; the adjustment being equal to the percentage adjustment in the bearing area required. For concrete used in over bends in the pipeline where no specified dimensions are shown for the thrust block, the measurement will be based on the actual quantity of concrete which the **ENGINEER** directs the **CONTRACTOR** to use.

b. **Payment** - Payment for Class B concrete shall be made on the basis of the unit price bid per cubic yard, and shall constitute full compensation for excavation, forming, furnishing and replacing of the concrete, and other incidental work required to complete the work. No

separate payment will be made for Class B concrete included in fire hydrant bracing, or other structures where the price of such concrete is included in the unit price or lump sum price bid for the item.

10.09 **PAVEMENT REPLACEMENT**

a. **Measurement** - Measurement for pavement replacement shall be equal to the length of the pavement cut multiplied by the width of pavement actually replaced within a strip having a maximum width equal to the nominal pipe diameter plus 3'-6" centered over the pipeline. Replacement limits shall be determined by the **ENGINEER**. For pavement replacement on State or Federal highways where concrete base is required, the maximum pay width will be increased to 7'-6".

b. **Payment** - Payment for pavement replacement shall be made on the basis of the unit prices bid for various classifications of pavement as indicated in the proposal form. Such payment shall constitute full compensation for furnishing all labor, materials and equipment and replacing the damaged pavement, including the crushed stone base as required. The **CONTRACTOR** is advised that although the limits of payment shall be as described under paragraph (a) above he shall be responsible for replacing all pavement damaged during construction, so that the paved area is left in a condition as good as or better than before the start of construction.

Payment for pavement replacement shall also include compensation for providing temporary pavement patches until such time as the permanent pavement is placed inasmuch as no separate payment will be made for this work.

10.10 **CRUSHED STONE**

a. **Measurement** - Measurement of crushed stone for payment shall be based on weight, but in certain instances as outlined below, volume computations will be used to determine the eligible pay weight. In all other cases delivery tickets shall be furnished to the **ENGINEER** at the time of placement. Crushed stone used for bedding water mains in rock excavation or in backfill of water lines to a point twelve inches (12") above pipe and backfill around fire hydrants and valves shall not be measured for payment. Payment shall be included in the unit price for pipe, valves or fire hydrant.

Crushed stone used as base material for pavement replacement also will not be measured for payment inasmuch as payment for this material will be included in the payment for pavement replacement.

Crushed stone used in trench backfill under traveled areas will be measured for payment as follows:

i. Eligible width equal to 18" plus nominal diameter.

ii. Eligible depth shall be measured vertically from a point 6" above top of pipe to bottom of crushed stone pavement base.

iii. Eligible length equal to length of water main under traveled area, plus the eligible depth under (b) above, (to allow for slope at ends).

iv. Volume as determined from the product of length times width times depth to be multiplied by 150 pounds per cubic foot to determine weight of crushed stone for payment.

Crushed stone required for maintenance of unpaved drives, roads, shoulders shall be at the **CONTRACTOR'S** expense and will not be measured for payment.

b. **Payment** - Payment for crushed stone, measured as provided above, which payment shall constitute full compensation for furnishing, hauling, placing and compacting the stone as specified.

10.11 CONNECTIONS TO EXISTING LINES

No additional compensation will be made for connections to existing lines as shown on drawings. Only those items employed in such connections, and appear in this Section will be paid for separately.

10.12 CASING PIPE

a. **Measurement** - Measurement of casing pipe installed under pavement, railroad tracks, structures or other places shall be by the linear foot and shall be the centerline length of casing installed land accepted.

b. **Payment** - Payment shall be made on the basis of the application unit price bid for various diameters and for various methods of installation. This price shall constitute payment for furnishing and installing casing pipe by boring and jacking or by excavation and backfilling, whichever is shown on the Plans or directed by the **ENGINEER**, including all labor, tools and equipment, crushed stone, boring, rock excavation, rock boring, and pavement replacement required (water pipe shall be paid for at applicable unit price bid).

10.13 BORE AND JACK WATER LINE

a. **Measurement** - Measurement of casing pipe installed under pavement, railroad tracks or other places by boring and jacking shall be measured by the linear foot and shall be the centerline length of pipe installed and accepted.

b. **Payment** - Main water lines laid by the boring and jacking method shall be paid for at the unit price bid for installing pipe of various diameters. This price shall include all labor, tools, and equipment (except as noted above) necessary to complete the items. No extra compensation shall be paid for the service line by Bore and Jack.

10.14 SERVICE CONNECTIONS

a. **Measurement** - Service connections will be measured by an actual count of each size and type of service installed, tested, disinfected and accepted. The unit price bid for this item shall include saddles, corporation stop, curb stops, yoke, meter box, water pressure regulator etc., as covered by Specifications and Plans.

b. **Payment** - Service connections assemblies placed and accepted, measured as provided above, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling and installing complete, testing and

disinfection, for excavation, preparation of bed and backfilling, and for the furnishing of all equipment, tools, and incidentals necessary to complete the item.

10.15 STANDARD BLOW-OFFS

a. **Measurement** - Standard blow-offs include 2" tapped plug, 2" gate valve, 2" bronze pipe, meter box, concrete brace, #77 mainguard hydrant, and 2" fittings. This item will be measured by an actual count of blow-offs installed, tested, sterilized and accepted.

b. **Payment** - Standard blow-off assemblies, installed and accepted will be paid for on the basis of the unit price per each and payment shall constitute full compensation for furnishing, hauling, installing complete, testing and sterilizing, for excavation, preparation of bed and backfilling, and for the furnishing of all equipment, tools and incidentals necessary to complete the item.

10.16 SERVICE RELOCATIONS AND RECONNECTIONS

a. **Measurement** - Service relocations will be measured by an actual count of each installed and accepted. The unit price bid for this item shall include tapping new mains, corporation stop, curb stop, yokes, meter box, and other fittings as covered by Specifications and Plans.

b. **Payment** - Services relocated and accepted will be paid for on the basis of the unit price per each and payment shall constitute full compensation for furnishing all materials, installing, excavation, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item.

10.17 SERVICE PIPE

a. **Measurement** – Measurement for the length of service pipe used for service installations and service relocations included for payment at the unit prices bid shall be the actual length installed and measured from the main to center of the meter box without deductions for meter couplings, and curb stops, etc.

b. **Payment** – Payment for installing only water service lines completed will be made at the contract unit price bid per linear foot for water service pipes of various sizes, types and classifications. Payment for installing service pipe shall constitute full compensation for excavation, installation, road borings with 2" PVC casing, backfill, disinfecting, testing, and other incidentals and related work necessary for the completion of the bid item.

10.18 AIR RELEASE VALVE ASSEMBLY

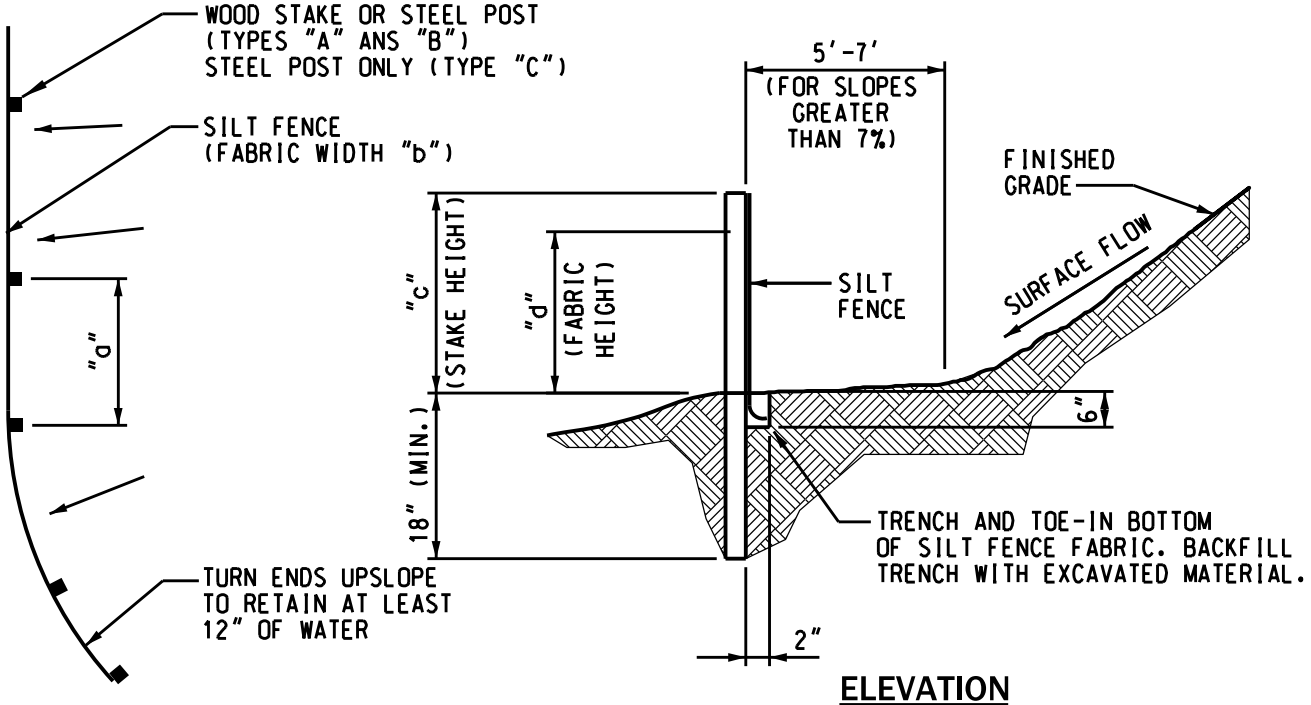
a. **Measurement** – Air release valve assemblies will be measured by an actual count of each size and type installed and accepted. The unit price bid for this item shall include tapping the main saddle, corporation stop, bronze gate valve, air release valve, manhole and cover, crushed stone and other fittings as covered by Specifications and Plans.

b. **Payment** – Air release valve assemblies installed and accepted will be paid on the basis of the unit price per each and payment shall constitute full compensation for furnishing all materials and supplies, and installing complete, testing, excavation and for the furnishing of all equipment, tools and incidentals necessary to complete the item.

SECTION 11

STANDARD DETAILS

WATER LINE ADDITIONS



ELEVATION

PLAN

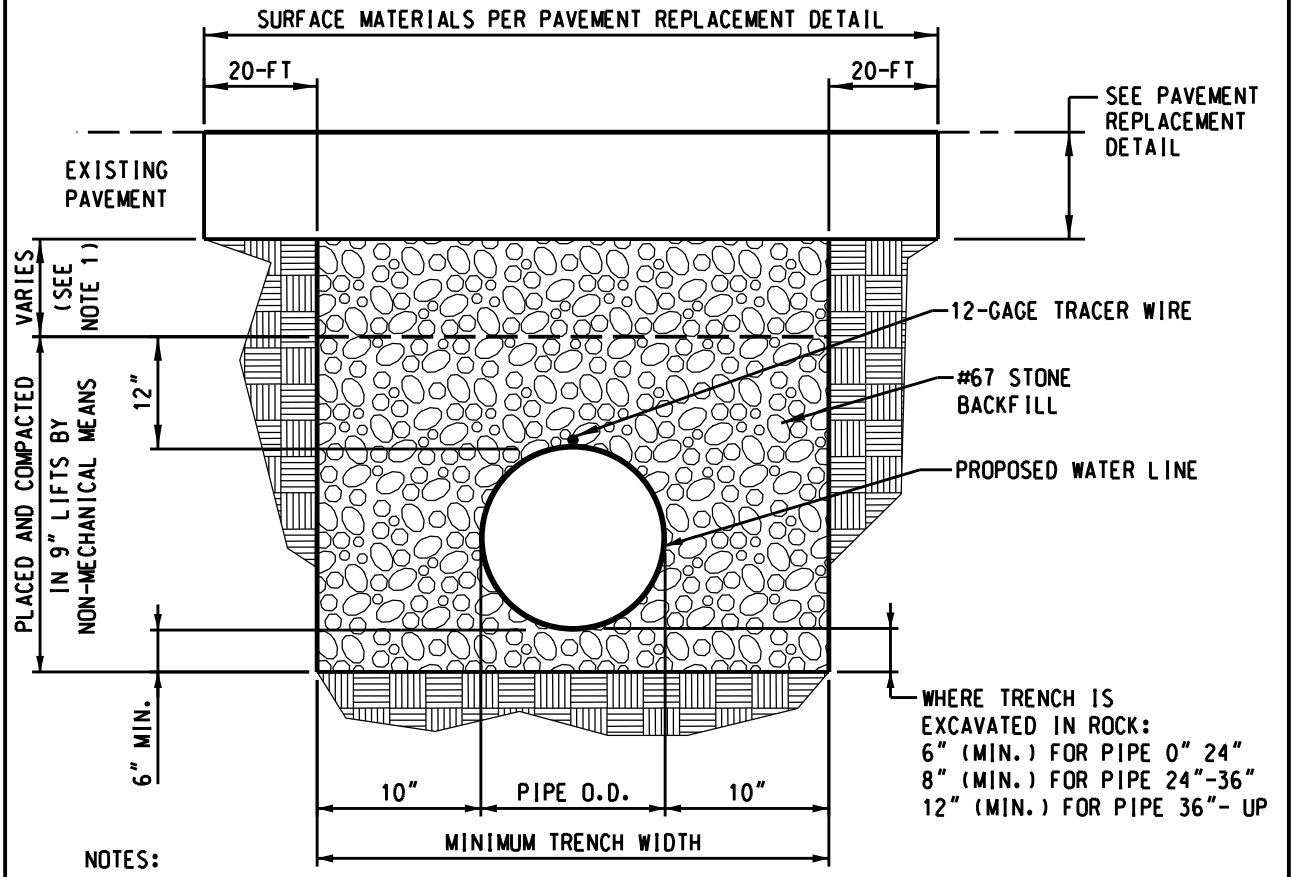
NOTES:

1. WOOD STAKES OR STEEL POSTS MAY BE USED WITH SILT FENCE TYPES "A" AND"B". ONLY STEEL POSTS SHALL BE USED WITH TYPE "C" SILT FENCE.

2. TYPE "C" SILT FENCE SHALL BE WIRE REINFORCED.

SILT FENCE TABLE						
TYPE	"a"	"b"	"c"	"d"	APPARENT OPENING SIZE	FLOW RATE (GPM)
A	6'	36"	30"	28"	#30 SIEVE	25
B	6'	22"	18"	16"	#30 SIEVE	25
C	4'	36"	30"	28"	#30 SIEVE	70

SILT FENCE DETAIL



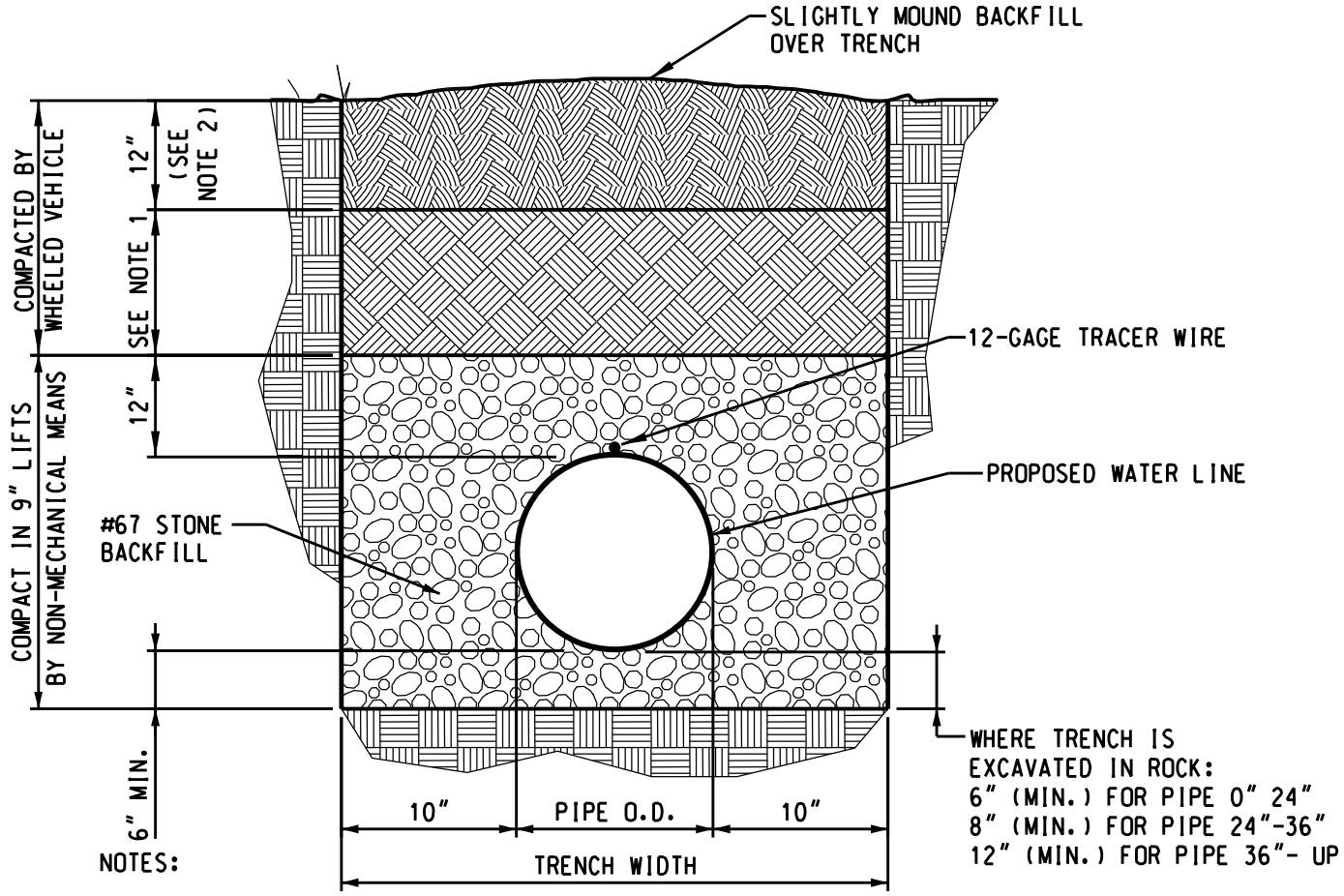
NOTES:

1. BACKFILL TO BE PLACED AND COMPACTED IN 9" LIFTS BY MECHANICAL MEANS.MATERIAL MAY BE EXCAVATED MATERIAL. HOWEVER. THIS MATERIAL SHALL NOT CONTAIN ROCKS GREATER THAN 6 INCHES IN ANY DIMENSION.

2. TAPE 12-GAGE SINGLE STRAND (SHIELDED) SOLID COPPER TRACER WIRE TO PIPE FOR DETECTION PURPOSES. JACKET TO BE BLUE IN COLOR.

3. METALLIC WARNING TAPE SHALL BE INSTALLED ON TOP OF THE GRAVEL ENVELOPE. TAPE SHALL READ "CAUTION BURIED WATER LINE BELOW".

TRENCH BACKFILLING DETAIL-STREETS



NOTES:

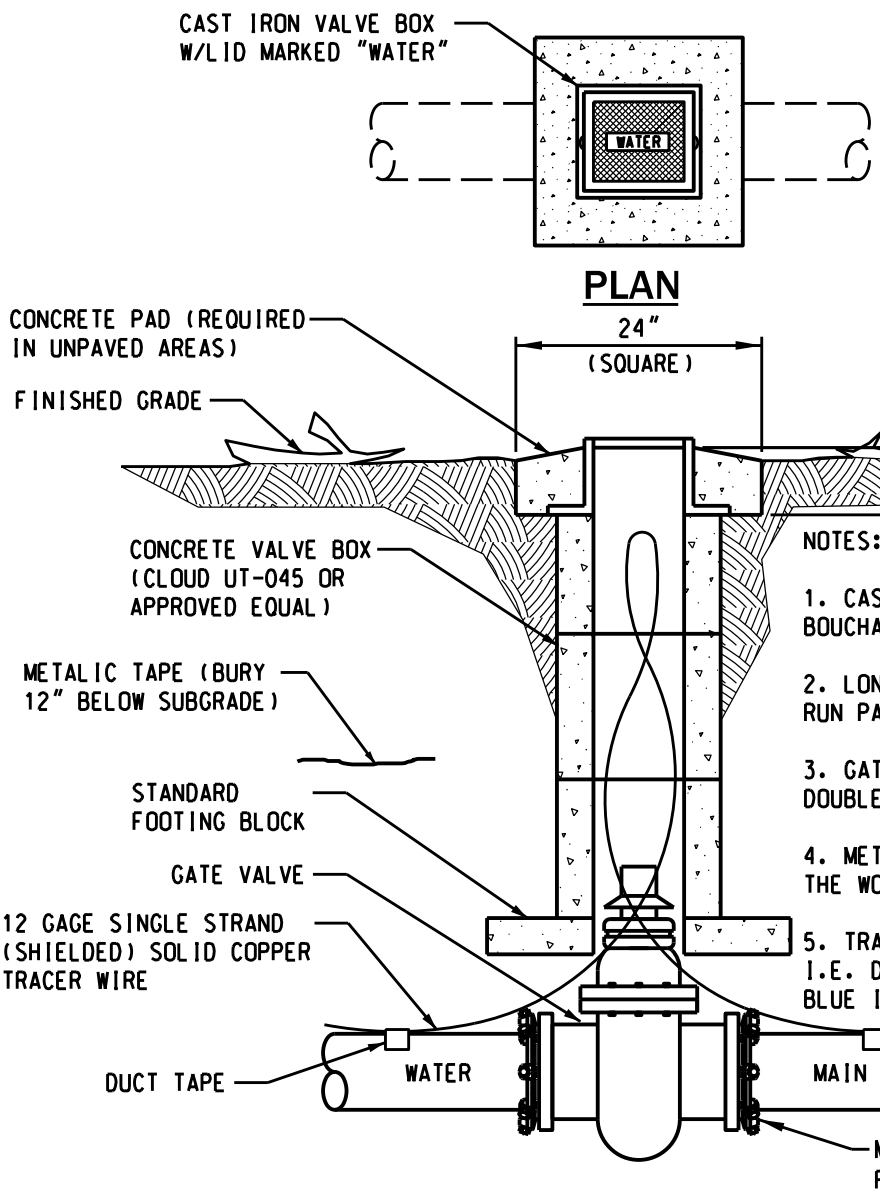
1. BACKFILL MATERIAL MAY BE EXCAVATED MATERIAL AND SHALL BE PLACED IN 12" LIFTS. HOWEVER, THIS MATERIAL SHALL NOT CONTAIN ROCKS GREATER THAN 6 INCHES IN ANY DIMENSION.

2. BACKFILL MATERIAL MAY BE EXCAVATED MATERIAL. HOWEVER, THIS MATERIAL SHALL NOT CONTAIN ROCKS GREATER THAN 1/ 2 INCH.

3. METALLIC WARNING TAPE SHALL BE INSTALLED 12" BELOW SUBGRADE. TAPE SHALL READ "CAUTION BURIED WATER LINE BELOW".

4. TAPE 12-GAGE SINGLE STRAND (SHIELDED) SOLID COPPER TRACER WIRE TO PIPE FOR DETECTION PURPOSES. JACKET TO BE BLUE IN COLOR.

TRENCH BACKFILLING DETAIL-UNPAVED AREAS



NOTES:

1. CAST IRON WATER VALVE BOXES TO BE JOHN BOUCHARD & SONS NO. 8006 OR APPROVED EQUAL.

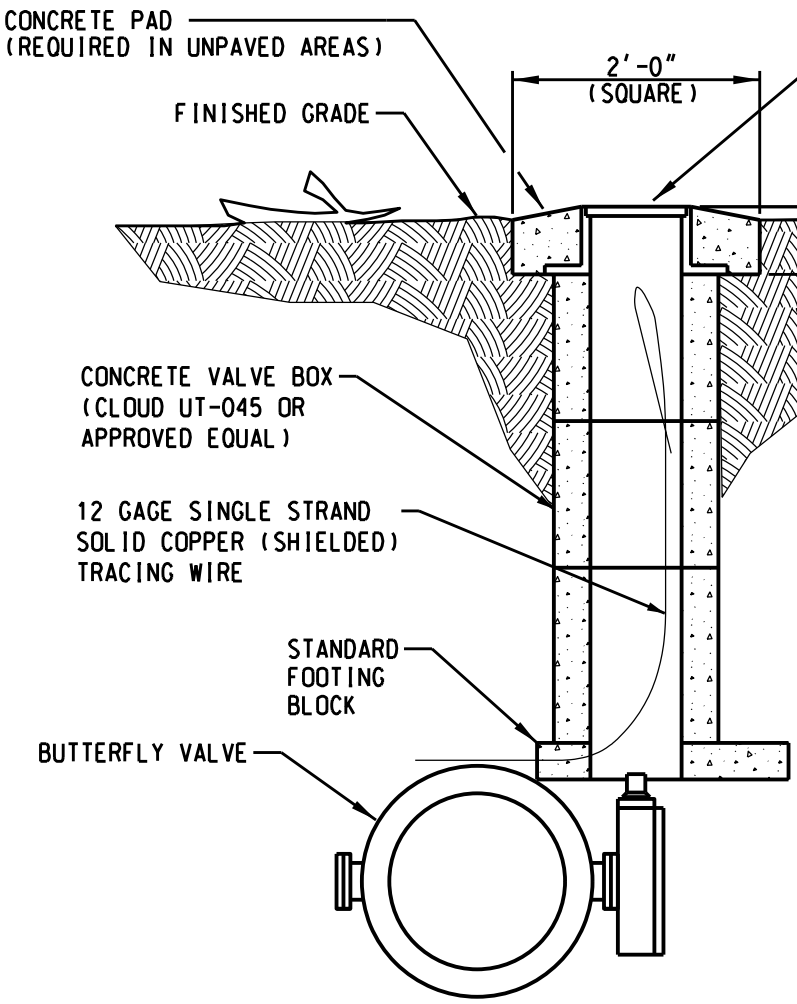
2. LONG SIDE OF CAST IRON VALVE BOX SHALL RUN PARALLEL TO THE MAIN IT IS CONTROLLING.

3. GATE VALVES 12" AND SMALLER TO BE DOUBLE DISC OR RESILIENT WEDGE.

4. METALIC TAPE SHALL BE IMPRINTED WITH THE WORD "WATER".

5. TRACER WIRE REQUIRED FOR ALL PIPE. I.E. DUCTILE IRON, PVC, ETC. JACKET TO BE BLUE IN COLOR.

TYPICAL GATE VALVE ASSEMBLY DETAIL



NOTES:

1. CAST IRON WATER VALVE BOXES TO BE JOHN BOUCHARD & SONS NO. 8006 OR APPROVED EQUAL.

2. BUTTERFLY VALVE SHALL BE HENRY PRATT "GROUNDHOG" OR APPROVED EQUAL.

3. LONG SIDE OF CAST IRON VALVE BOX SHALL RUN PARALLEL TO THE MAIN IT IS CONTROLLING.

4. METALIC TAPE SHALL BE IMPRINTED WITH THE WORD "WATER" AND SHALL BE BURIED 12" BELOW SUBGRADE.

5. TRACER WIRE REQUIRED FOR ALL PIPE, I.E. DUCTILE IRON, PVC, ETC. JACKET TO BE BLUE IN COLOR.

BUTTERFLY VALVE ASSEMBLY DETAIL

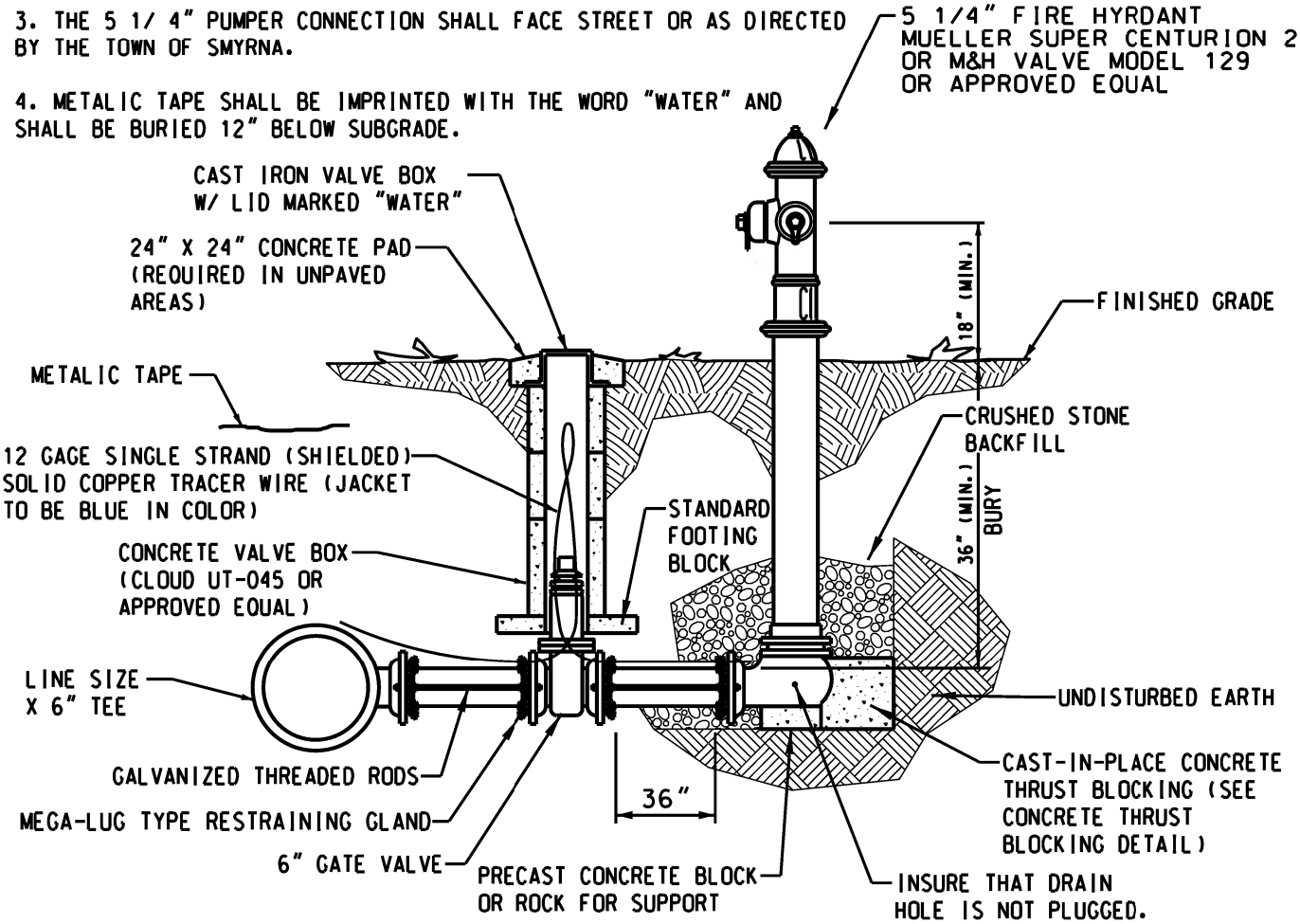
NOTES:

1. OPERATING NUT, OPENING DIRECTION, NOZZLE CAP NUTS, THREAD AND CONNECTIONS SHALL CONFORM TO TOWN OF SMYRNA STANDARDS.

2. CAST IRON WATER VALVE BOXES TO BE JOHN BOUCHARD & SONS NO. 8006 OR APPROVED EQUAL

3. THE 5 1/ 4" PUMPER CONNECTION SHALL FACE STREET OR AS DIRECTED BY THE TOWN OF SMYRNA.

4. METALIC TAPE SHALL BE IMPRINTED WITH THE WORD "WATER" AND SHALL BE BURIED 12" BELOW SUBGRADE.



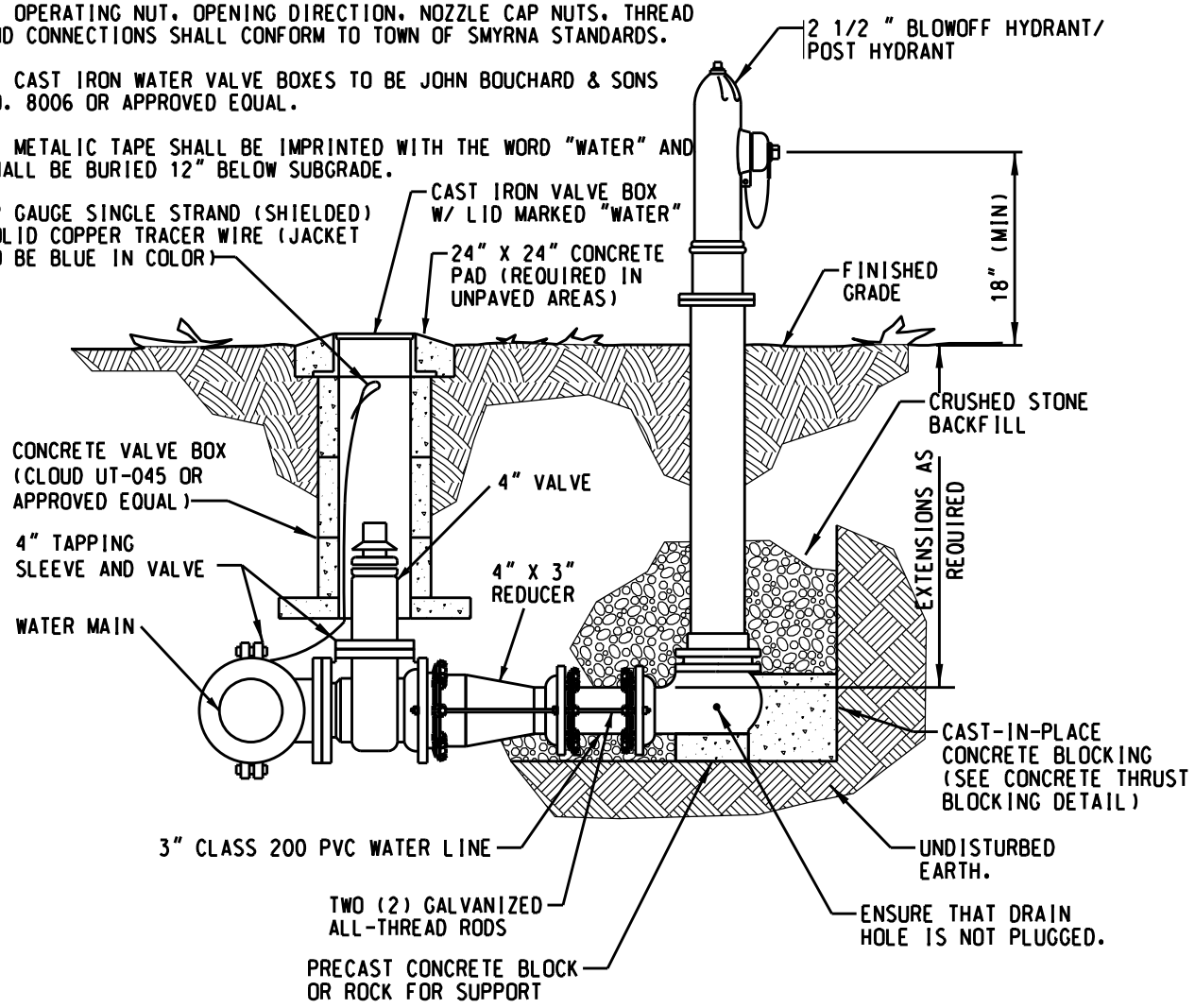
FIRE HYDRANT ASSEMBLY DETAIL

NOTES:

1. OPERATING NUT, OPENING DIRECTION, NOZZLE CAP NUTS, THREAD AND CONNECTIONS SHALL CONFORM TO TOWN OF SMYRNA STANDARDS.

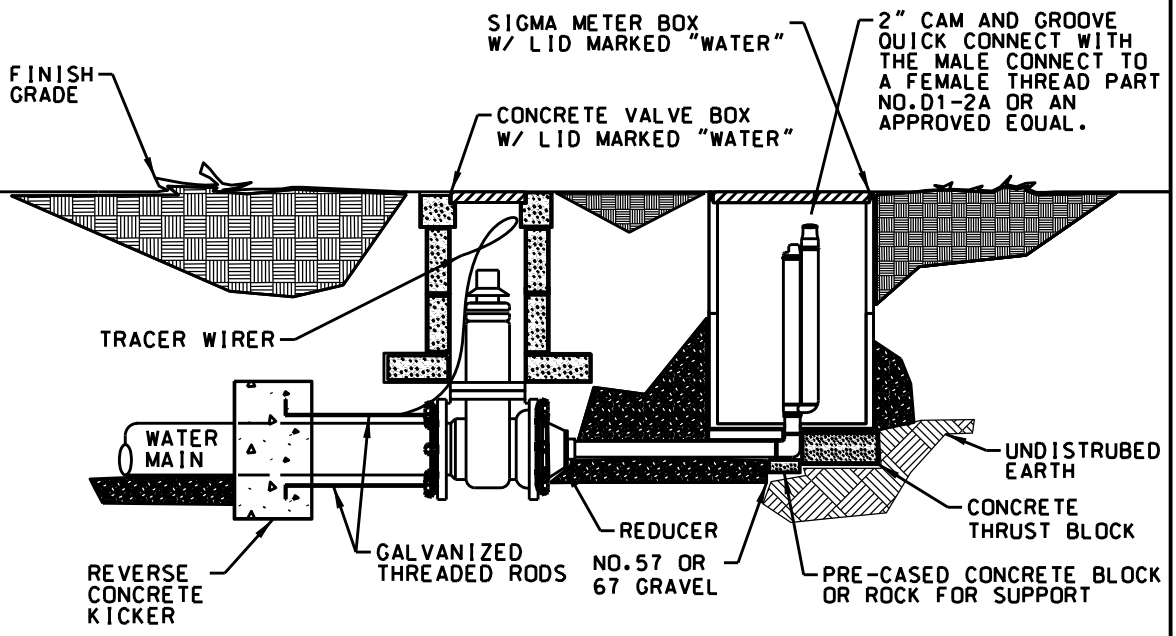
2. CAST IRON WATER VALVE BOXES TO BE JOHN BOUCHARD & SONS NO. 8006 OR APPROVED EQUAL.

3. METALIC TAPE SHALL BE IMPRINTED WITH THE WORD "WATER" AND SHALL BE BURIED 12" BELOW SUBGRADE.

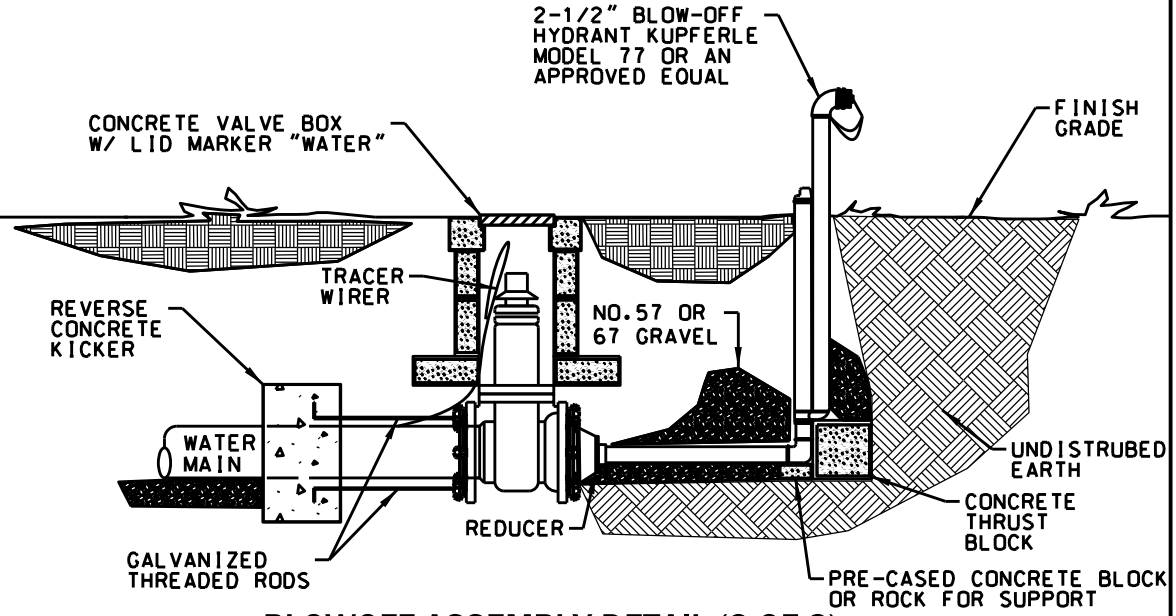


BLOWOFF ASSEMBLY DETAIL (1 OF 3)

BELOW GROUND



ABOVE GROUND



BLOWOFF ASSEMBLY DETAIL (2 OF 3)

NOTES:

1. OPERATING NUT, OPENING DIRECTION, NOZZLE CAP NUTS, THREAD AND CONNECTIONS SHALL CONFORM TO TOWN OF SMYRNA STANDARDS.

2. CAST IRON WATER VALVE BOXES TO BE JOHN BOUCHARD & SONS NO. 8006 OR APPROVED EQUAL.THE VALVE BOX SHALL BE SQUARED & HAVE THE WORD "WATER"IMPRINTED ON IT.

3. METALIC TAPE SHALL BE PRINTED WITH THE WORD "WATER" SHALL BE BURIED 12" BELOW SUBGRADE.

4. THE BLOWOFF SHALL BE PLACE AT THE END OF THE WATER MAIN WITH A VALVE TO OPERATE THE BLOW-OFF. THE VALVE SHALL BE THE SAME SIZE AS THE WATER MAIN.

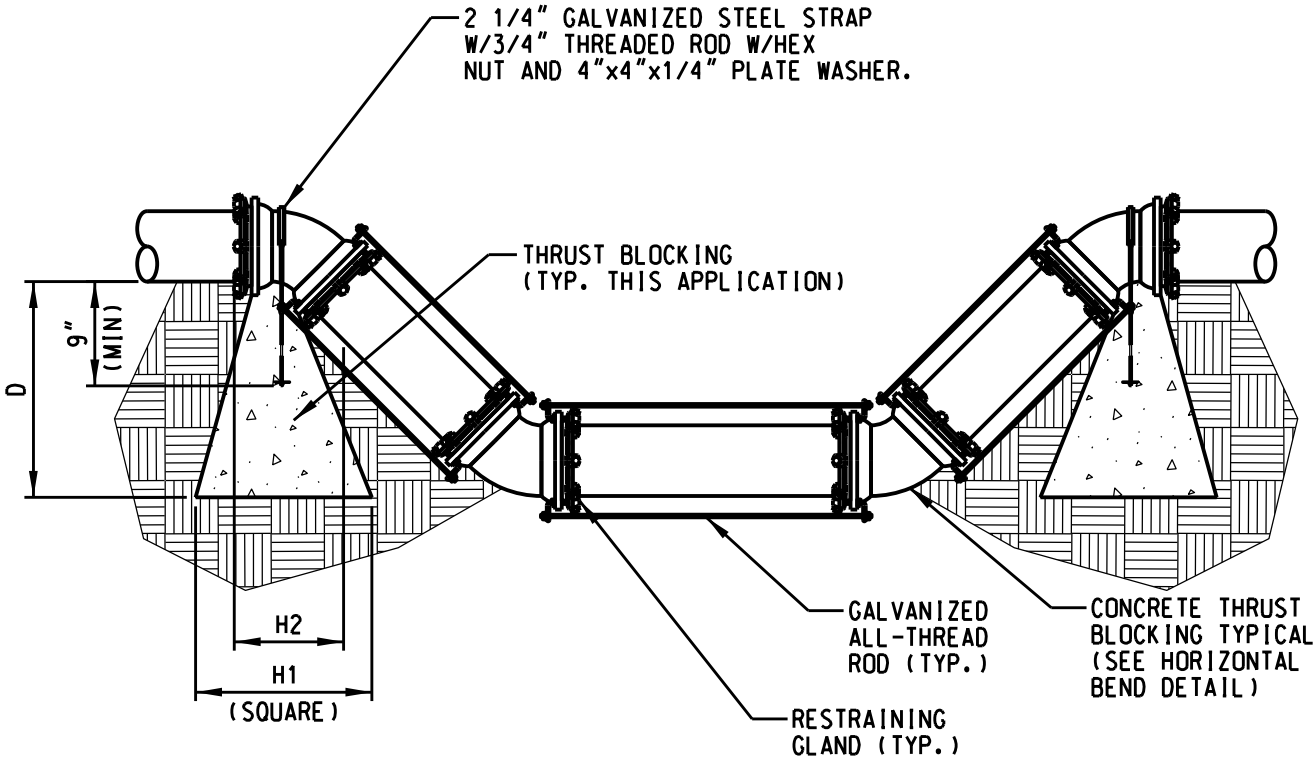
5. THE POST HYDRANT SHALL BE A 2-1/2" M&H MODEL 33 OR AN APPROVED EQUAL.

6 ABOVE GROUND BLOWOFFS SHALL BE KUPFERLE MODEL 77 OR AN APPROVED EQUAL. BELOW GROUND BLOWOFFS SHALL BE KUPFERLE MODEL 78 OR AN APPROVED EQUAL.

7. BELOW GROUND BLOWOFFS SHALL BE INSTALLED IN A GREEN SPACE AREA WITHIN A SIGMA METER BOX. SIGMA RMB-173018-SW (BOX) & SIGMA RMB-1730-L-RT (LID). IF INSTALLED IN A PAVED AREA, THEN THE BLOW-OFF SHALL BE HOUSED IN A CONCRETE VALVE BOX WITH A CAST IRON WATER CASTING LID.

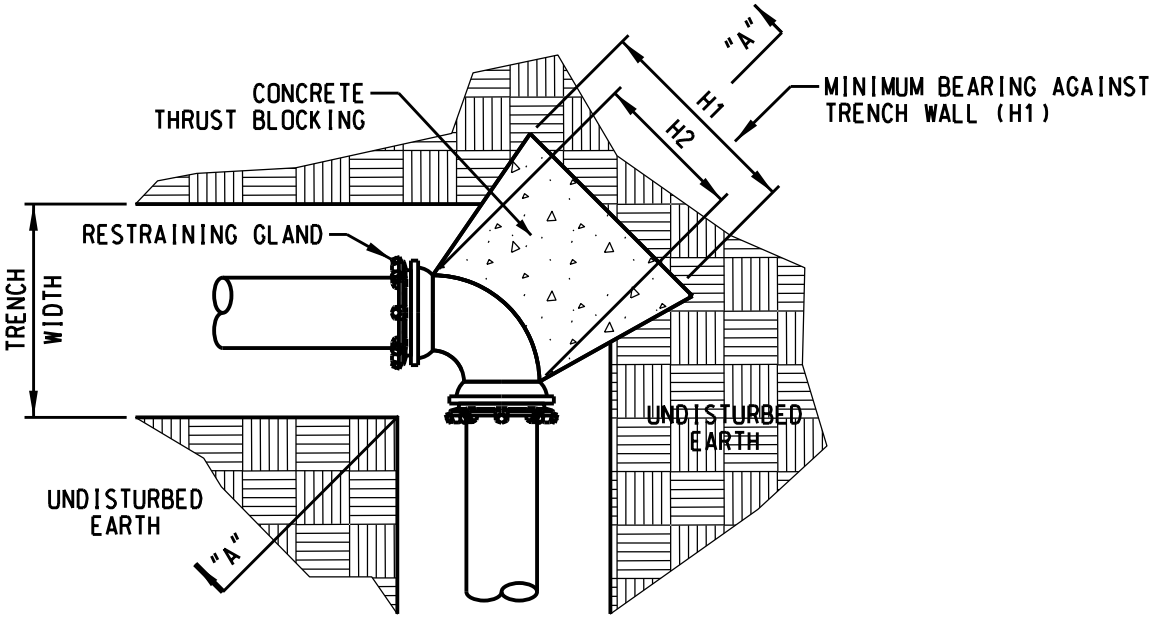
8. BELOW GROUND BLOWOFFS SHALL BE INSTALLED WITH A 2" CAM AND GROOVE QUICK CONNECT WITH THE MALE CONNECT TO A FEMALE THREAD. PART NO. D1-2A OR AN APPROVED EQUAL.

BLOWOFF ASSEMBLY DETAIL (3 OF 3)

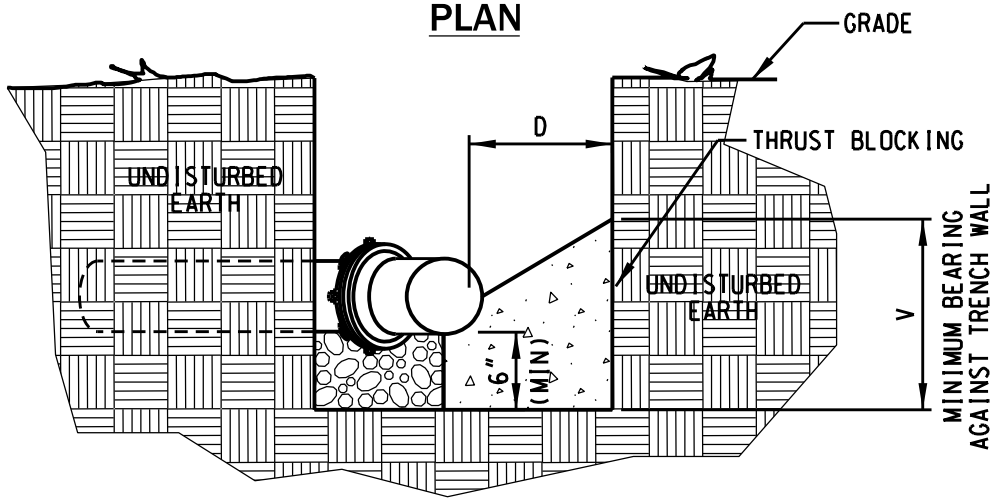


VERTICAL BENDS

CONCRETE THRUST BLOCKING (1 OF 4)

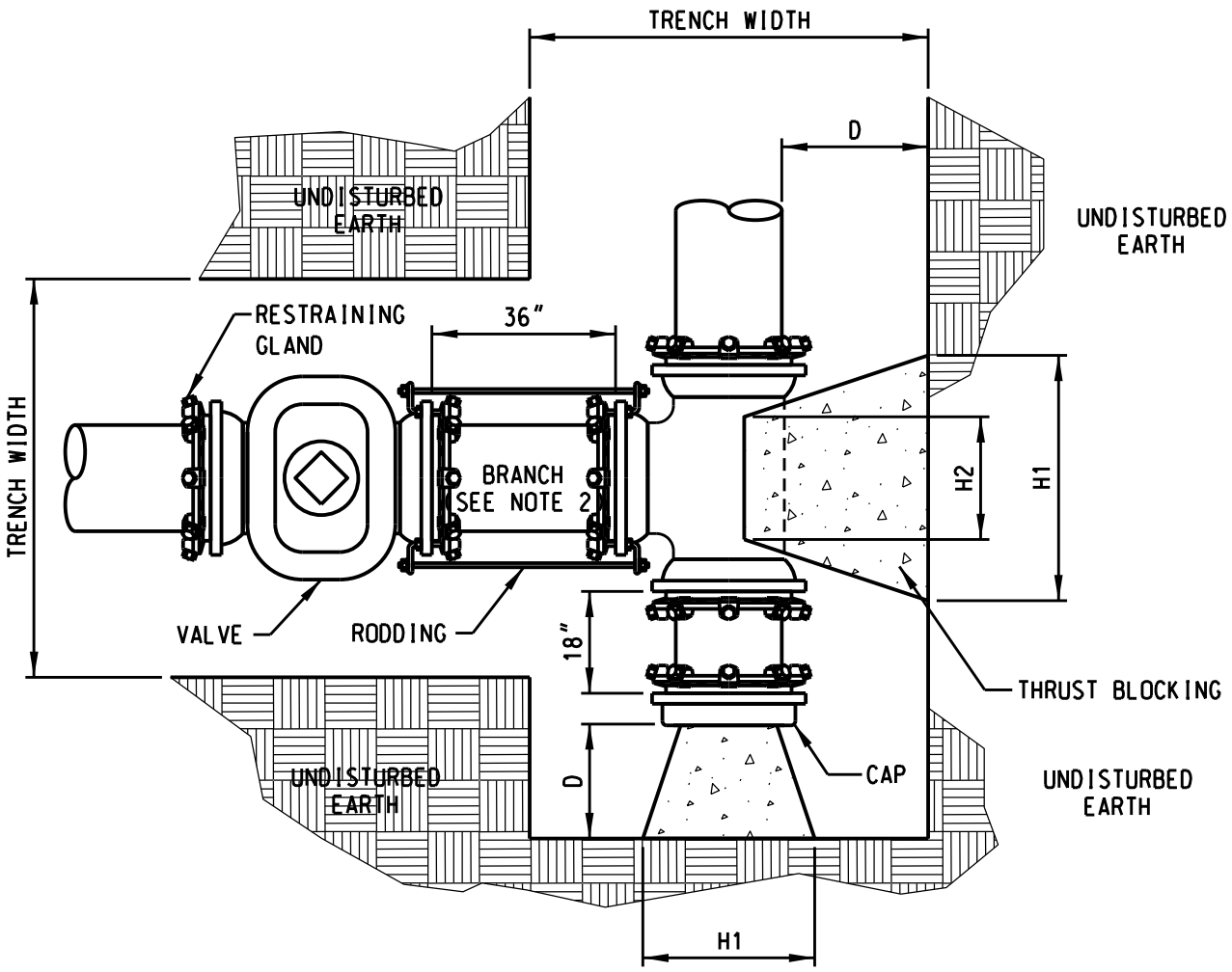


PLAN



SECTION "A-A"

CONCRETE THRUST BLOCKING (2 OF 4)



TEES AND CAPS

CONCRETE THRUST BLOCKING (3 OF 4)

TEES, CROSSES, AND PLUGS					90° BENDS					45° BENDS					22-1/2° BENDS					11-1/4° BENDS					PIPE SIZE	MIN.# OF 3/4" ALL THREAD RODS
H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.		
18"	10"	12"	18"	1.90	18"	10"	12"	18"	1.90	18"	6"	12"	18"	1.50	18"	6"	12"	18"	1.50	18"	6"	12"	18"	1.50	2" - 2¼"	2
24"	12"	12"	18"	2.25	24"	12"	12"	18"	2.25	18"	8"	12"	18"	1.60	18"	8"	12"	18"	1.60	18"	8"	12"	18"	1.60	3" - 4"	2
24"	16"	18"	18"	3.50	30"	16"	18"	18"	4.05	24"	10"	16"	18"	3.20	24"	10"	16"	18"	3.20	24"	10"	16"	18"	3.20	6"	4
36"	18"	18"	24"	5.05	39"	18"	24"	18"	7.30	30"	12"	18"	18"	3.95	24"	12"	18"	18"	3.45	24"	12"	16"	18"	3.40	8"	4
48"	24"	18"	24"	7.15	54"	32"	24"	18"	10.25	36"	18"	21"	18"	4.60	24"	18"	21"	18"	4.60	24"	18"	21"	18"	4.60	10"	6
54"	30"	24"	24"	13.40	54"	32"	36"	24"	18.15	42"	18"	24"	24"	9.60	24"	18"	24"	24"	6.60	24"	18"	21"	24"	6.10	12"	6
60"	32"	30"	24"	17.90	60"	40"	42"	24"	25.00	44"	24"	30"	24"	13.20	30"	24"	24"	24"	9.20	27"	21"	24"	24"	7.90	14"	8
66"	34"	36"	24"	22.50	69"	48"	48"	24"	29.00	48"	30"	36"	24"	17.00	36"	30"	27"	24"	11.80	27"	24"	27"	24"	9.10	16"	8
66"	36"	40"	24"	27.50	69"	48"	48"	24"	33.00	48"	30"	36"	24"	17.00	36"	30"	29"	24"	13.00	27"	30"	29"	24"	11.00	18"	8
	38"		24"			48"		24"			40"		24"			36"		24"		30"	40"		28"		20"	10
	42"		24"			60"		24"			48"		24"			42"		24"			42"		32"		24"	12
	58"		24"			96"		24"			72"		24"			72"		24"			48"		36"		36"	18

NOTES:

1. THRUST BLOCKING WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR 3000 PSI CONCRETE FOR THE VOLUME SHOWN IN THE ABOVE TABLE FOR EACH FITTING SO BLOCKED ONLY IF A SEPARATE ITEM APPEARS IN THE SCHEDULE OF A PROPOSAL FOR A UNIT PRICE CONTRACT. OTHERWISE, THERE WILL BE NO SEPARATE PAYMENT FOR CONCRETE THRUST BLOCKING.

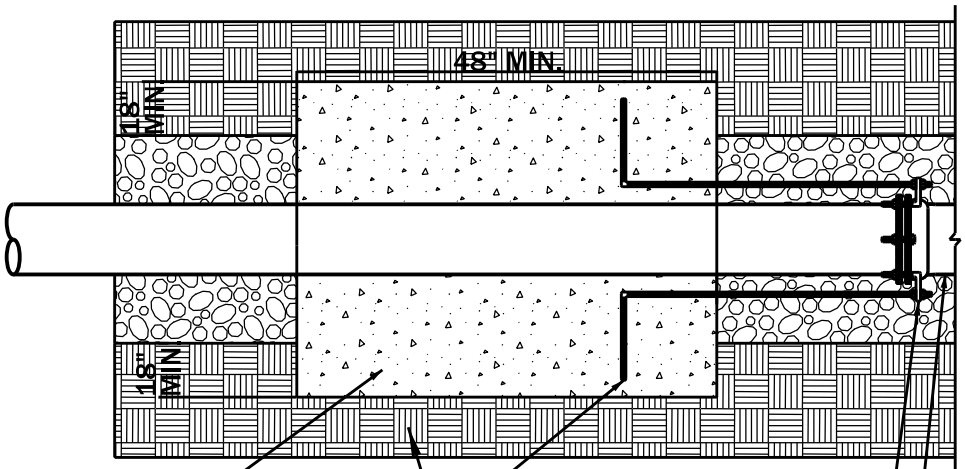
2. DIMENSIONS ARE CONTROLLED BY DIAMETER OF BRANCH MAIN.

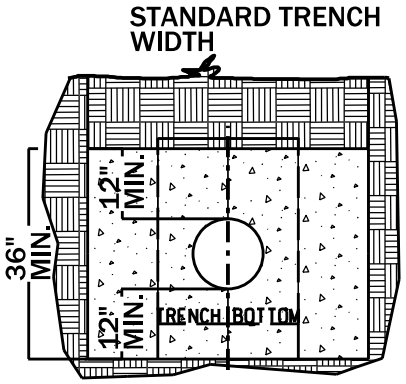
3. THRUST BLOCKING SHALL BE PLANT MIX CONCRETE. SAC CRETE OR BAGGED CONCRETE MIX SHALL NOT BE ALLOWED.

4. RODS SHALL BE GALVANIZED. TWO RODS SHALL BE INSTALLED FOR PIPE DIAMETERS 8" AND LESS. FOUR RODS SHALL BE INSTALLED FOR PIPE DIAMETERS 10" AND GREATER.

CONCRETE THRUST BLOCKING (4 OF 4)

PLAN





SECTION

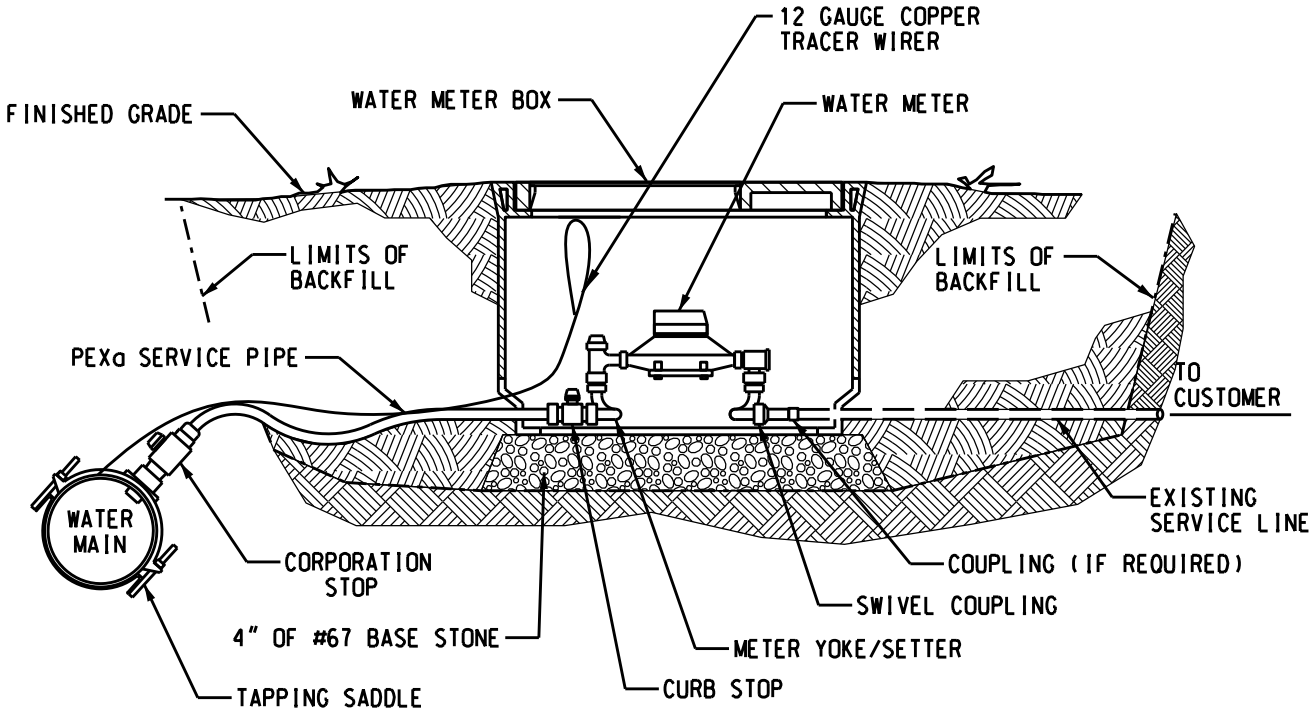
NOTES:

1. REVERSE THRUST BLOCKING SHALL BE "KEYED-INTO" UNDISTURBED EARTH ON THREE SIDES OF TRENCH.

2. A MINIMUM OF 4 90°EYE BOLTS AND THREADED RODS PER REVERSE THRUST BLOCK.

3. THE AMOUNT OF RODS NEEDED FOR THE REVERSE KICKER SHALL BE THE AMOUNT HALF THE SIZE OF THE PIPE.
EX: 8" PIPE = 4 GALVANIZED THREADED RODS

REVERSE CONCRETE THRUST BLOCKING DETAIL



SECTION

NOTES:

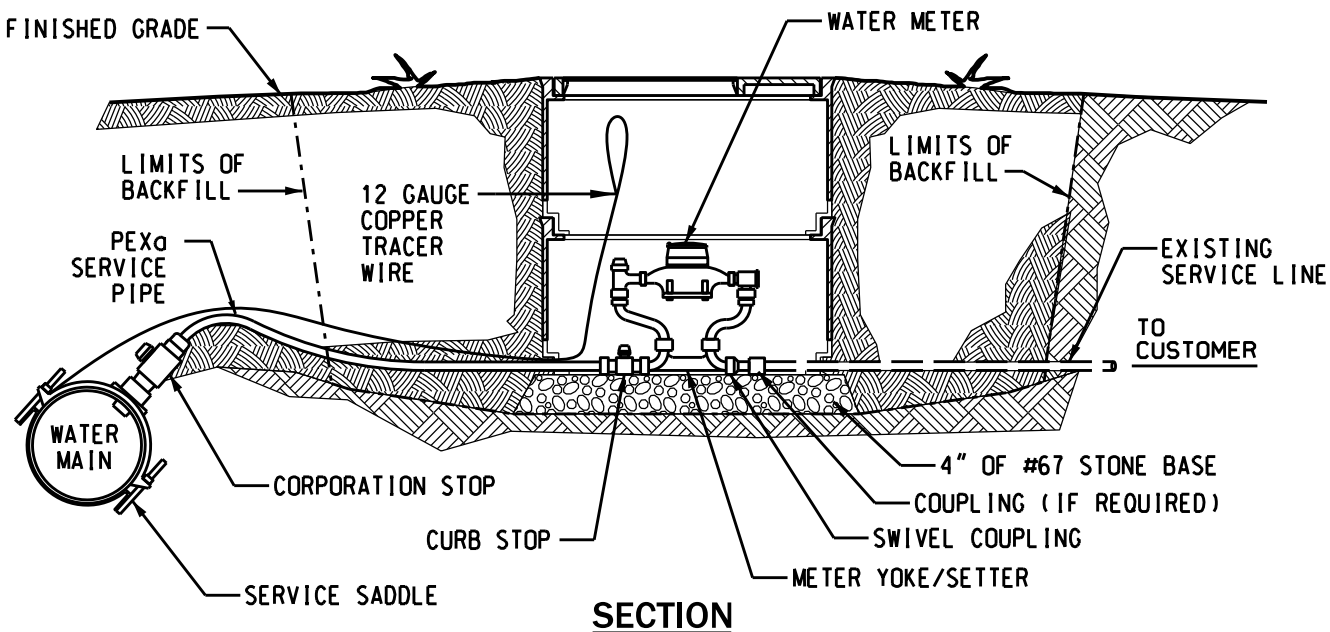
1. FINAL GRADE SHALL SLOPE AWAY FROM THE TOP OF THE METER BOX IN ORDER TO SHED WATER.
2. THE GROUND SHALL BE EXCAVATED NO LESS THAN TWO FEET BEYOND THE METER BOX ON ALL SIDES AND TO THE FULL DEPTH OF THE METER BOX AND BASE STONE. BACKFILL MATERIAL SHALL BE ROCK-FREE SOIL.
3. METER BOX SHALL BE SIGMA RMB-132418-SW.
4. METER BOX LIDS SHALL BE SIGMA RMB-1324-L-RT.
5. 12 GAUGE COPPER TRACER WIRE SHALL BE TAPED TO THE WATER SERVICE LINE. CONNECTION BETWEEN THE WATER MAIN WIRE AND WATER SERVICE SHALL BE CONNECTED WITH A WATER TIGHT WIRE NUT FASTENERS (EXAMPLE: DRYCONN) AND WRAPPED. THE ENDS OF THE WIRE SHALL TERMINATE FROM THE MAIN TO THE METER. THE WIRE SHALL HAVE A MINIMUM OF 24" INSIDE THE METER BOX.
6. ALL WATER SERVICE LINES SHALL BE BACKFILLED WITH QUARTER DOWN (DUST) WITH 6" ON BOTTOM AND SIDES AND 12" ON TOP. THIS SHALL BE DONE FROM WATER MAIN TO THE METER.

3/4" SERVICE ASSEMBLY DETAIL (1 OF 2)

3/4" WATER METER

ITEM	MANUFACTURER		COMMENTS
TAPPING SADDLE - ¾" FOR C900	SMITH - BLAIR	315-00101007-000	SS STRAP
CORPORATION STOP - ¾" TAPER X¾" CTS	FORD METER	FB1000-3-O-NL	-
CURB STOP - ¾" W/ 360° LOCKING WINGNUT	MUELLER	B43-232WR-O-NL	-
METER RELOCATOR	MUELLER	234B24118R5---N	-
⅝" X¾" W/ 360° LOCKWING	FORD	VBHH42-7WR-NL	-
AND DUAL CHECK (SETTER)			-
METER - ¾" W/ ITRON CONNECTOR	BADGER	MODEL 25LL	-
SWIVEL COUPLING	FORD METER	C38-23-2.5-NL	-
⅝" X¾" X¾" X 2.5" LONG			-
WASHER,¾" X⅛" BLACK RUBBER	ANY		-
PIPE- ¾" PEX@ SERVICE PIPE	ANY		SDR-9; BLUE
METER BOX	SIGMA		-
LID; READ DOOR & RECESS TOUCH READ HOLE	SIGMA		-

3/4" SERVICE ASSEMBLY DETAIL (2 OF 2)



SECTION

NOTES:

1. THE WATER METER BOX INSTALLATION SHALL UTILIZE TWO STACKED METER BOXES TO ACHIEVE A 36" DEPTH. FINAL GRADE SHALL SLOPE AWAY FROM THE METER BOX IN ORDER TO SHED WATER.

2. THE GROUND SHALL BE EXCAVATED NO LESS THAN TWO FEET BEYOND THE METER BOX ON ALL SIDES AND TO THE FULL DEPTH OF THE METER BOX AND BASE STONE. BACKFILL MATERIAL SHALL BE ROCK-FREE SOIL.

3. METER BOXES SHALL BE SIGMA RMB-173018-SW.

4. METER BOX LID SHALL BE SIGMA RMB-1730-L-RT.

5. 12 GAUGE COPPER TRACER WIRE SHALL BE TAPED TO THE WATER SERVICE LINE. CONNECTION BETWEEN THE WATER MAIN WIRE AND WATER SERVICE SHALL BE CONNECTED WITH A WATER TIGHT WIRE NUT FASTENERS (EXAMPLE: DRYCONN) AND WRAPPED. THE ENDS OF THE WIRE SHALL TERMINATE FROM THE MAIN TO THE METER. THE WIRE SHALL HAVE A MINIMUM OF 24" INSIDE THE METER BOX.

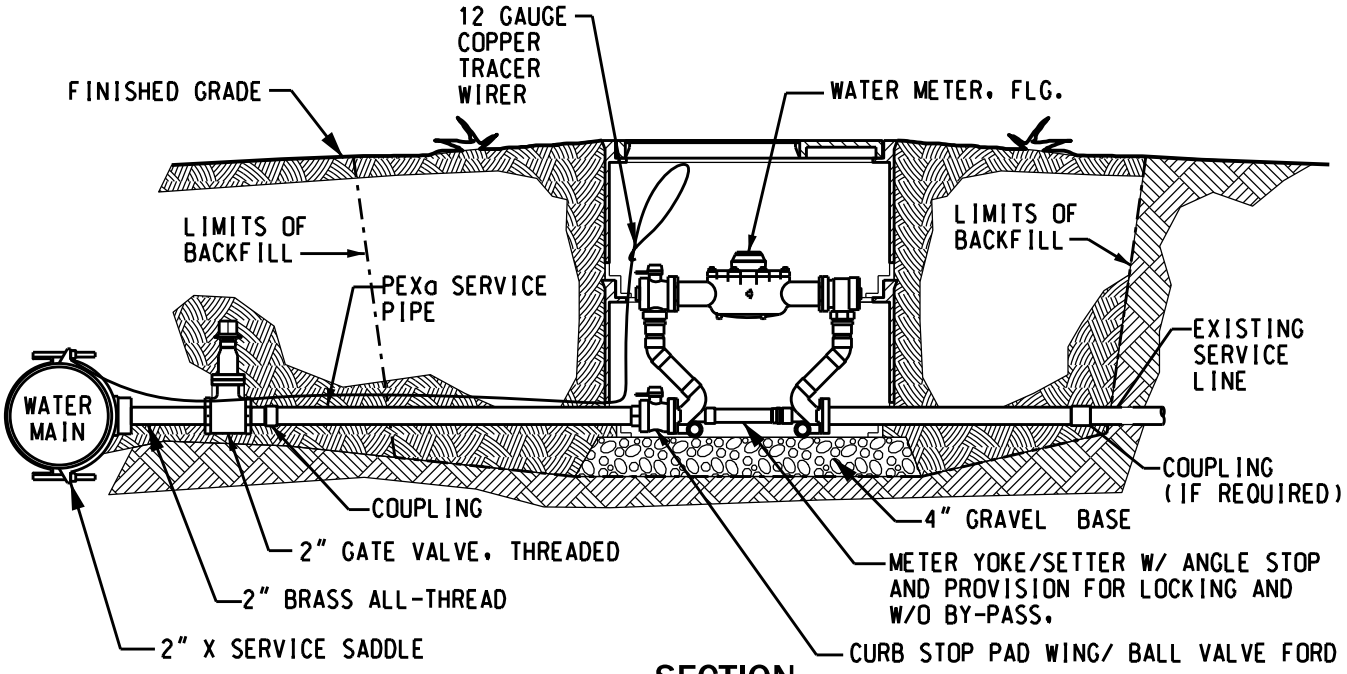
6. ALL WATER SERVICE LINES SHALL BE BACKFILLED WITH QUARTER DOWN (DUST) WITH 6" ON BOTTOM AND SIDES AND 12" ON TOP. THIS SHALL BE DONE FROM WATER MAIN TO THE METER.

1" WATER METER ASSEMBLY DETAIL (1 OF 2)

1" WATER METER

ITEM	MANUFACTURER	MODEL / PART NO.	COMMENTS
TAPPING SADDLE - 1" FOR C900	SMITH - BLAIR	315-00101009-000	SS STRAP
CORPORATION STOP - 1" TAPER CC X 1" CTS	FORD METER	FB1000-4-0-NL	-
CURB STOP - 1" W/ 360° LOCKING WINGNUT	MEULLER	B43-344-WM-0-NL	-
METER RELOCATER 1" X 10" W/ 360° LOCKWING AND DUAL CHECK (SETTER)	MUELLER FORD	389B24118R5---N VBHH44-10-NL	-
METER - 1" W/ITRON CONNECTOR		MODEL 70LL	-
SWIVEL COUPLING - 1" STRAIGHT	BADGER	C38-44-2-625-NL	-
WASHER - 1" X 1/8" BLACK RUBBER	FORD METER	-	-
PIPE- 1" PEX@ SERVICE PIPE	ANY	-	SDR-9; BLUE
METER BOX	SIGMA	RMB-173018-SW	-
LID: READER DOOR & RECESS TOUCH READ HOLE	SIGMA	RMB-1730-L-RT	-

1" WATER METER ASSEMBLY DETAIL (2 OF 2)



SECTION

NOTES:

1. THE WATER METER BOX INSTALLATION FOR BOTH THE 1 1/ 2" AND 2" METERS SHALL UTILIZE TWO STACKED METER BOXES TO ACHIEVE A 36" DEPTH. FINAL GRADE SHALL SLOPE AWAY FROM THE TOP OF THE METER BOX IN ORDER TO SHED WATER.

2. THE GROUND SHALL BE EXCAVATED NO LESS THAN TWO FEET BEYOND THE METER BOX ON ALL SIDES AND TO THE FULL DEPTH OF THE METER BOX AND BASE STONE. BACKFILL MATERIAL SHALL BE ROCK-FREE SOIL.

3. METER BOXES SHALL BE: SIGMA RMB-173018-SW

4. METER BOX LID SHALL BE: SIGMA RMB-1730-L-RT

5. 12 GAUGE COPPER TRACER WIRE SHALL BE TAPED TO THE WATER SERVICE LINE. CONNECTION BETWEEN THE WATER MAIN WIRE AND WATER SERVICE SHALL BE CONNECTED WITH A WATER TIGHT WIRE NUT FASTENERS (EXAMPLE: DRYCONN) AND WRAPPED. THE ENDS OF THE WIRE SHALL TERMINATE FROM THE MAIN TO THE METER. THE WIRE SHALL HAVE A MINIMUM OF 24" INSIDE THE METER BOX.

6. ALL WATER SERVICE LINES SHALL BE BACKFILLED WITH QUARTER DOWN (DUST) WITH 6" ON BOTTOM AND SIDES AND 12" ON TOP. THIS SHALL BE DONE FROM WATER MAIN TO THE METER.

1 - 1/2" AND 2" WATER METER ASSEMBLY DETAIL (1 OF 2)

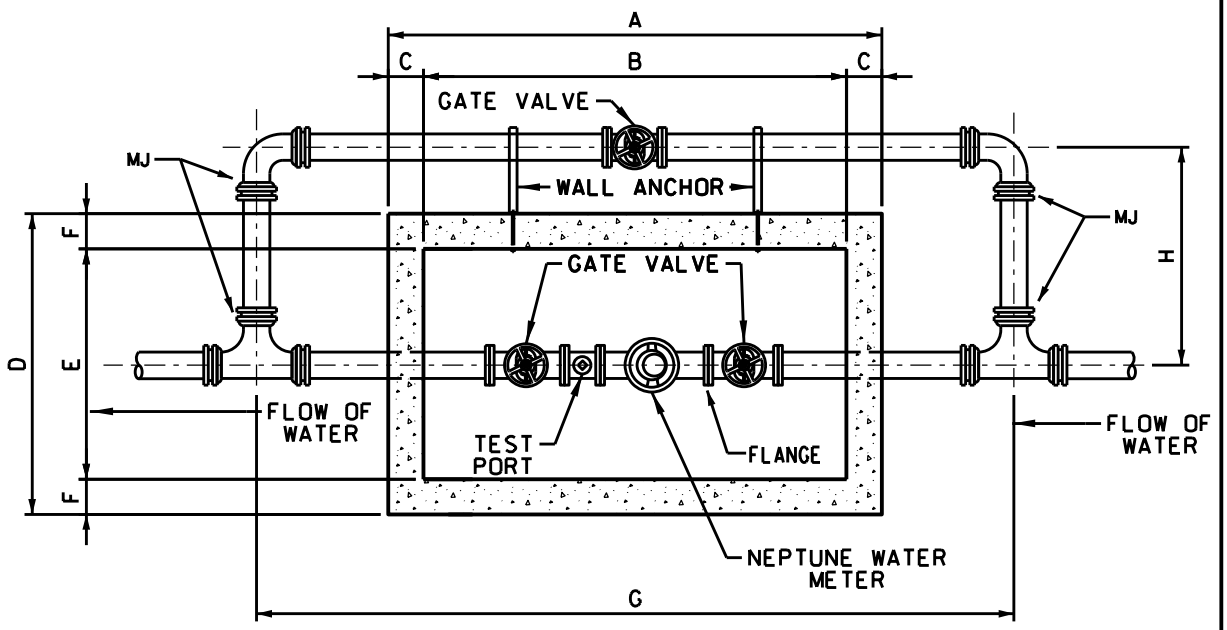
1 &1/2" WATER METER

ITEM	MANUFACTURER	MODEL / PART NO.	COMMENTS
TAPPING SADDLE-2" FOR C900	SMITH-BLAIR	315-00090514-000	SS STRAP
BRASS-2" ALL-THREAD	MATCO - NORCA	NBR08CL	NO-LEAD BRASS
GATE VALVE-2"	KENNEDY VALVE	228D2X	THREADED W/ 2" NUT
COUPLING-2" SOLDER TO MALE	ANY	-	ASTM B16
CURB STOP-2" CTS X 1½"	FORD METER	BF13-777W-NL	W/ 2" FLANGE
METER RISER 1½" X 14" W/ 360°	MUELLER	063B2424--5N	FLANGED
LOCKING WINGNUT AND DUAL CHECK (SETTER)	FORD	VBRHH46-14-NL	
METER W/ ITRON CONNECTOR	BADGER	MODEL 120LL	FLANGED
METER BRASS FLANGE PAK - 1½"	ANY	-	NO-LEAD BRASS
COUPLING - 2" SOLDER	ANY	-	ASTM B16
COUPLING - 2"- 45° SOLDER	ANY	-	ASTM B16
COUPLING - 2" - 90°, SOLDER	ANY	-	ASTM B16
PIPE-PEX@ SERVICE PIPE	ANY	2K60	SDR-9; BLUE
METER BOX	SIGMA	RMB-173018-SW	-
LID: READER DOOR & RECESS TOUCH READ HOLE	SIGMA	RMB-1730-L-RT	-

2" WATER METER

ITEM	MANUFACTURER	MODEL / PART NO.	COMMENTS
TAPPING SADDLE - 2" FOR C900	SMITH-BLAIR	315-00090514-00	SS STRAP
BRASS - 2" ALL-THREAD	MATCO - NORCA	NBR08CL	NO-LEAD BRASS
GATE VALVE - 2"	KENNEDY VALVE	228D2X	THREADED W/ 2" NUT
COUPLING-2" SOLDER TO MALE	ANY	-	ASTM B16
CURB STOP - 2" CTS X 1½"	FORD METER	BF43-777W-0-NL	W/ 2" FLANGE
METER RISER 2" X 14" W/ 360°	MUELLER	087B2424--5N	FLANGED
LOCKING WING AND DUAL CHECK (SETTER)	FORD	VBRHH47-14-NL	
METER W/ ITRON CONNECTOR	BADGER	MODEL 170LL	FLANGED
METER BRASS FLANGE PAK - 2"	ANY	-	NO-LEAD BRASS
COUPLING - 2" SOLDER	ANY	-	ASTM B16
COUPLING - 2" - 45° SOLDER	ANY	-	ASTM B16
COUPLING - 2" - 90° SOLDER	ANY	-	ASTM B16
PIPE-PEX@ SERVICE PIPE	ANY	-	SDR-9; BLUE
METER BOX	SIGMA	RMB-173018-SW	-
LID: READER DOOR & RECESS TOUCH READ HOLE	SIGMA	RMB-1730-L-RT	-

1 - 1/2" AND 2" WATER METER ASSEMBLY DETAIL (2 OF 2)



DIMENSIONS								
SIZE	A	B	C	D	E	F	G	H
4"	96"	84"	6"	72"	60"	6"	124"	60"
6"	96"	84"	6"	72"	60"	6"	128"	64"
8"	96"	84"	6"	72"	60"	6"	132"	68"
10"	144"	132"	6"	72"	60"	6"	172"	84"
12"	144"	132"	6"	72"	60"	6"	176"	88"

MASTER METER PIT DETAIL (1 OF 2)

GENERAL NOTES:

1. ULTRASONIC METERS MANUFACTURED BY NEPTUNE METERS SHALL BE USED. METER TO MEASURE IN U.S. GALLONS AND SET TO READ IN 100s. THE METER SHALL HAVE AN ITRON CONNECTION WITH 5ft. LEAD FOR 2" METERS AND 25ft. LEAD FOR ALL OTHERS. ALL METERS SHALL COME EQUIP WITH FLANGE PACKS.

2. ALL DUCTILE IRON PIPE SHALL BE PUSH-ON JOINT SPECIAL THICKNESS CLASS 350.

3. ALL MECHANICAL JOINT DUCTILE IRON FITTINGS SHALL BE AWWA C153 CLASS 350. ALL MECHANICAL JOINT FITTINGS SHALL USE MEGA-LUG TYPE RESTRAINING GLANDS.

4. GATE VALVES SHALL BE RESILIENT WEDGE MEETING AWWA C515 REQUIREMENTS. BYPASS VALVE SHALL BE ABOVE GROUND POST INDICATOR.

5. CONCRETE VAULT TO MEET THE CURRENT REQUIREMENTS OF ASTM C857 AND C858 FOR STRUCTUAL DESIGN AND LOADINGS. THE VAULT SHALL BE DESIGNED FOR H-20 LOADING.

6. VAULT DEPTH SHALL BE DETERMINED AND SIZED ACCORDINGLY.

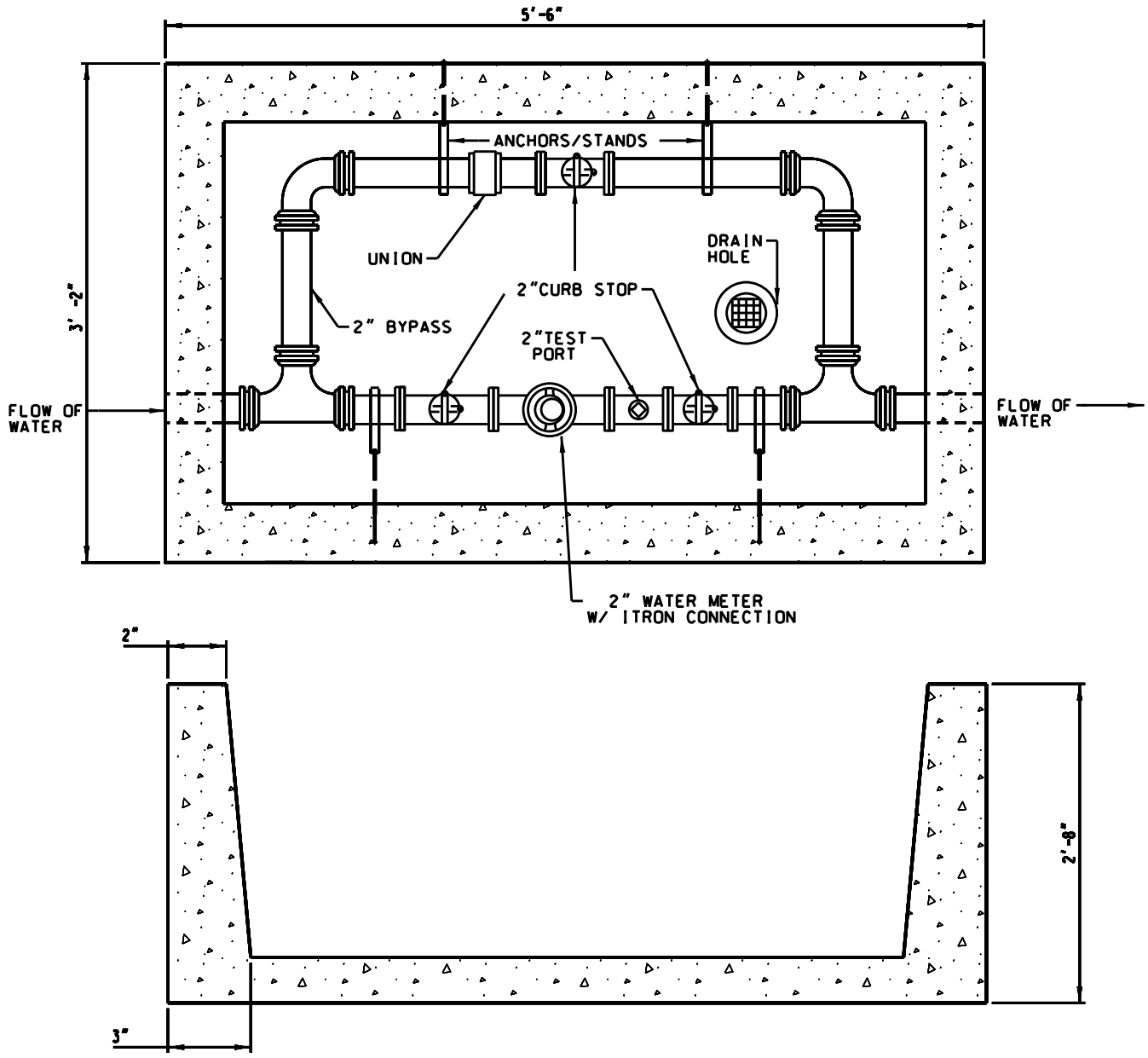
7. VAULT HATCH SHALL BE DOUBLE LEAF ALUMINUM HATCHES. FOR 4" THRU 6" METERS USE HALLIDAY MODEL H2W4848 OR BILCO MODEL JD-2AL-H20. FOR 8" THRU 12" METERS USE HALLIDAY MODEL H2W7248 OR BILCO MODEL JD-3A-H20L. THE VAULT HATCH SHALL BE BOLTED TO THE CONCRETE VAULT. THE HATCH SHALL HAVE 2" THICK WEATHER PROOF AND WATER RESISTANT INSULATION GLUED TO THE BOTTOM OF THE LID. THE GLUE AND/OR ADHESIVE SHALL BE WEATHER PROOF AND WATER RESISTANT.

8. DRAIN LINE SHALL BE 4" CLASS 200 PVC.

9. TEST PORT TO BE 2" WITH GATE VALVE AND PLUG.

10. METER MUST BE EQUIPPED WITH ITRON AUTOMATED METER READING SYSTEM (AMR). AN ANTENNA HOLE IS TO BE CUT FOR THE ITRON METER ENDPOINT.

MASTER METER PIT DETAIL (2 OF 2)



2" METER PIT DETAIL (1 OF 2)

GENERAL NOTES:

1. ULTRASONIC METERS MANUFACTURED BY NEPTUNE METERS SHALL BE USED. METER TO MEASURE IN U.S. GALLONS AND SET TO READ IN 100s. THE METER SHALL HAVE AN ITRON CONNECTION WITH 5ft. LEAD FOR 2" METERS. ALL METERS SHALL COME EQUIP WITH A FLANGE PACK.

2. VAULT SHALL BE G&C 660 METER VAULT OR APPROVED EQUAL.

3. CONCRETE VAULT TO MEET THE CURRENT REQUIREMENTS OF ASTM C857 AND C858 FOR STRUCTUAL DESIGN AND LOADINGS.

4. VAULT HATCH SHALL BE FULL SIZE ALUMINUM LID. HALLIDAY MODEL H2W4848 OR BILCO MODEL JD-2AL-H20.THE VAULT HATCH SHALL BE BOLTED TO THE CONCRETE VAULT.THE HATCH SHALL HAVE 2" THICK WEATHER PROOF AND WATER RESISTANT INSULATION GLUED TO THE BOTTOM OF THE LID. THE GLUE AND/OR ADHESIVE SHALL BE WEATHER PROOF AND WATER RESISTANT.

5. ALL BRASS PIPE AND FITTINGS SHALL HAVE ASTM B43 PRESSURE RATING.

6. CURB STOPS SHALL BE A 2" FORD CURB STOP OR APPROVED EQUAL.

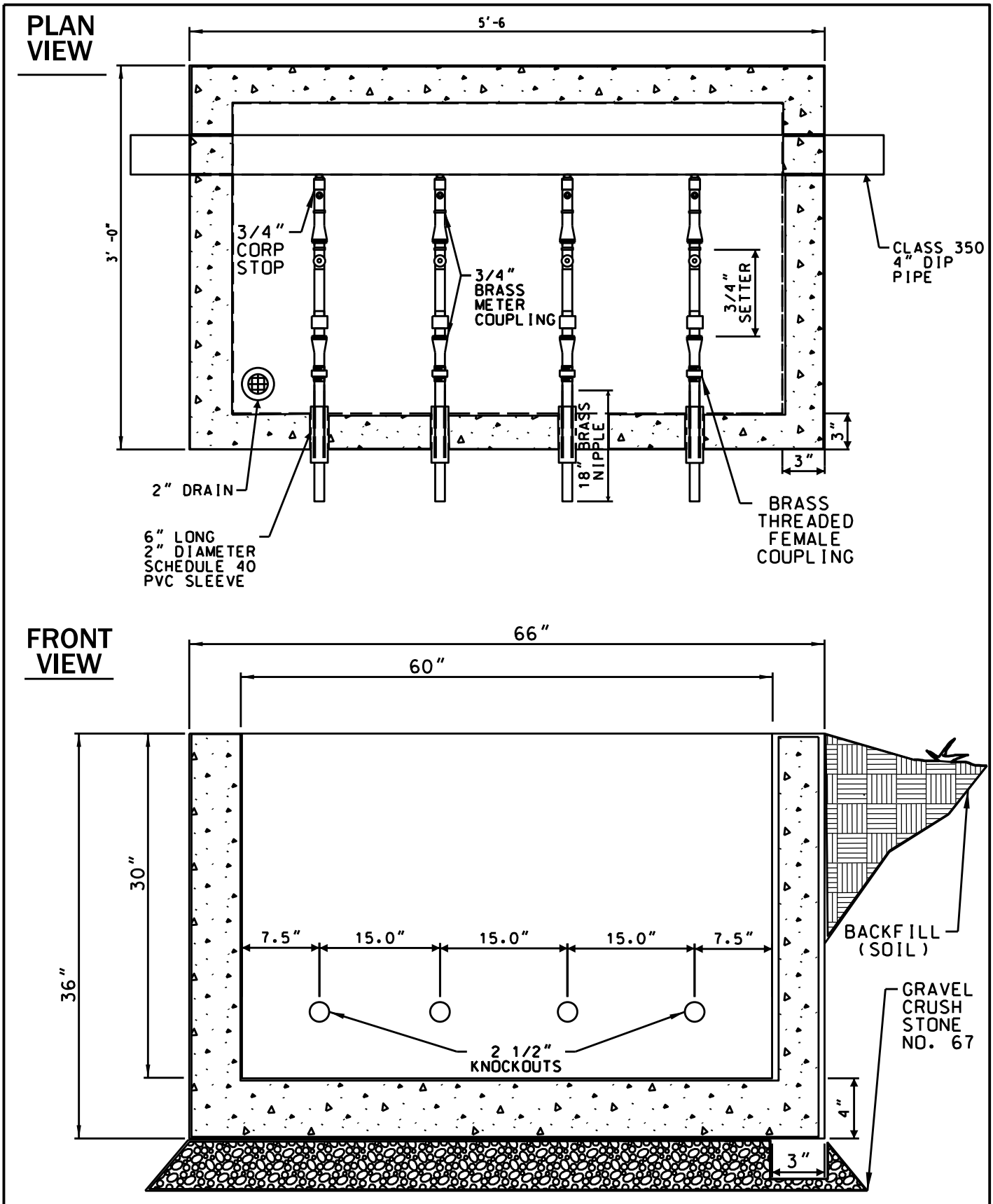
7. THE BYPASS SHALL BE 2" BRASS PIPE IN CONJUCTION WITH A 2" FORD CURB STOP AND A BRASS UNION FITTING.

8. THE CONCRETE VAULT SHALL HAVE A 2" DRAIN AT THE BASE OF THE VAULT. THE VAULT SHALL BE INSTALLED WITH 6" BEDDING OF GRAVEL (CRUSHED STONE NO. 67) ON THE BOTTON OF THE CONCRETE VAULT.THE VAULT SHALL BE INSTALLED 3" TO 6" ABOVE FINAL GRADE WITH GOOD SOIL/DIRT, WHICH SHALL BE SLOPED AWAY FROM THE VAULT ON EACH OF IT'S SIDES.

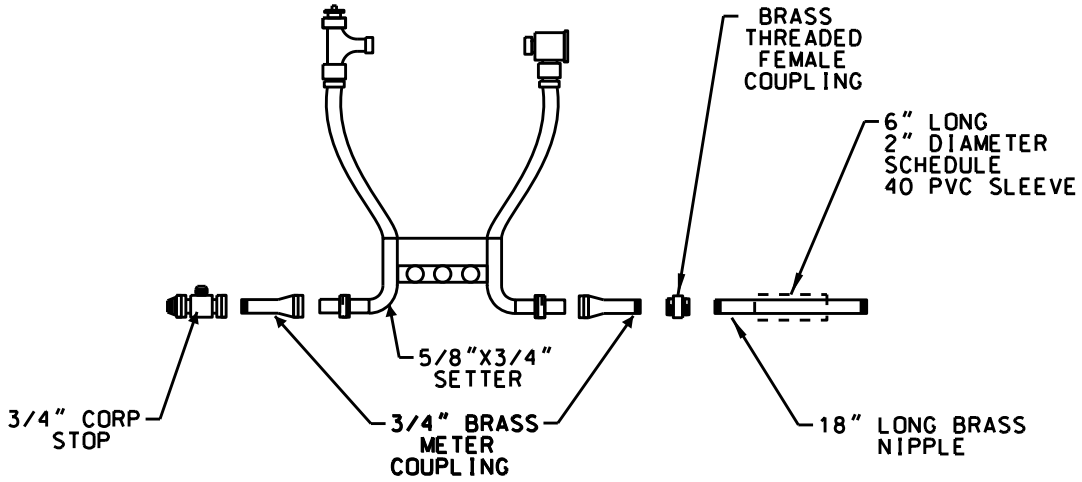
9. TEST PORT TO BE 2" WITH CURB STOP AND PLUG. THE TEST PORT IS TO BE INSTALLED BEHIND THE METER ON THE CUSTOMER'S SIDE OF THE METER.

10. METER MUST BE EQUIPPED WITH ITRON CONNECTION FOR THE ITRON AUTOMATED METER READING SYSTEM. AN ANTENNA HOLE IS TO BE CUT FOR THE ITRON ENDPOINT.

2" METER PIT DETAIL (2 OF 2)



FOUR(4) GANG 3/4" WATER METER VAULT (1 OF 2)



GENERAL NOTES:

1. VAULT SHALL BE A HOLTON CONCRETE VAULT OR AN APPROVED EQUAL. ALL CONCRETE VAULT CONCRETE SHALL HAVE A MINIMUM OF 4,000-psi. STRENGTH AND CURRED FOR 28-DAYS.

2. EACH VAULT SHALL HAVE A 2" DRAIN AT THE BASE OF THE VAULT. THE CONCRETE VAULT SHALL HAVE A 6" BEDDING OF GRAVEL (CRUSHED STONE NO. 67) ON THE BOTTOM OF THE VAULT. THE VAULT SHALL BE INSTALLED 3"-6" ABOVE FINISHED GRADE WITH GOOD SOIL/DIRT SLOPE AWAY FROM FROM THE EDGE OF THE VAULT ON EACH OF IT'S SIDES.

3. VAULT HATCH SHALL BE FULL SIZE ALUMINUM LID HALLIDAY MODEL OR AN APPROVED EQUAL. THE HATCH SHALL HAVE 2" THICK WEATHER PROOF AND WATER RESISTANT INSULATION GLUED TO THE BOTTOM OF THE LID. THE GLUE AND/OR ADHESIVE SHALL BE WEATHER PROOF AND WATER RESISTANT. THE VAULT HATCH SHALL BE BOLTED TO THE CONCRETE VAULT.

4. AN ANTENNA HOLE IS TO BE CUT FOR EACH METERS' ITRON ENDPOINT.

5. THE WATER SERVICE MAIN SHALL BE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

6. ALL WATER SERVICES ARE TO USE A DIRECT TAP INTO THE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

7. CONCRETE VAULT TO MEET THE CURRENT REQUIREMENTS OF ASTM C857 AND C858 FOR STRUCTUAL DESIGN AND LOADINGS.

8. EACH WATER SERVICE SHALL HAVE AN 18" BRASS NIPPLE, WHICH IS SLEEVE THROUGH THE VAULTS WALL WITH A 6" LONG PIECE OF 2" PVC SCHEDULE 40 PIPE. THE SLEEVE IS TO BE GREAT FOAMED AT INSIDE AND OUTSIDE OF THE VAULT.

9. EACH WATER SERVICE ASSEMBLY SHALL BE HYDROSTATICLY PRESSURE TESTED AFTER BEING ASSEMBLIED AT 150-psi. FOR ONE (1) HOUR. HYDROSTATIC PRESSURE SHALL BE CERTIFIED WITH CERTIFICATE OF COMPLETION.

10. ALL WATER SERVICE ASSEMBLIES SHALL BE INSTALLED FROM THE SECOND MIDDLE KNOCKOUT HOLE WITHIN THE VAULT. THE WATER SERVICE ASSEMBLIES SHALL HAVE AN EVEN AMOUNT OF ASSEMBLIES FROM THE CENTER OF THE CONCRETE VAULT.

PARTS LIST:

1. 5/8"X3/4"X7" WATER METER SETTER: FORD PART NO. VBHH42-7WR-NL OR MUELLER PART NO. 234B2418R5-N OR APPROVED EQUAL

2. 3/4" BRASS METER COUPLING: FORD PART NO. C38-23-2-5-NL OR APPROVED EQUAL.

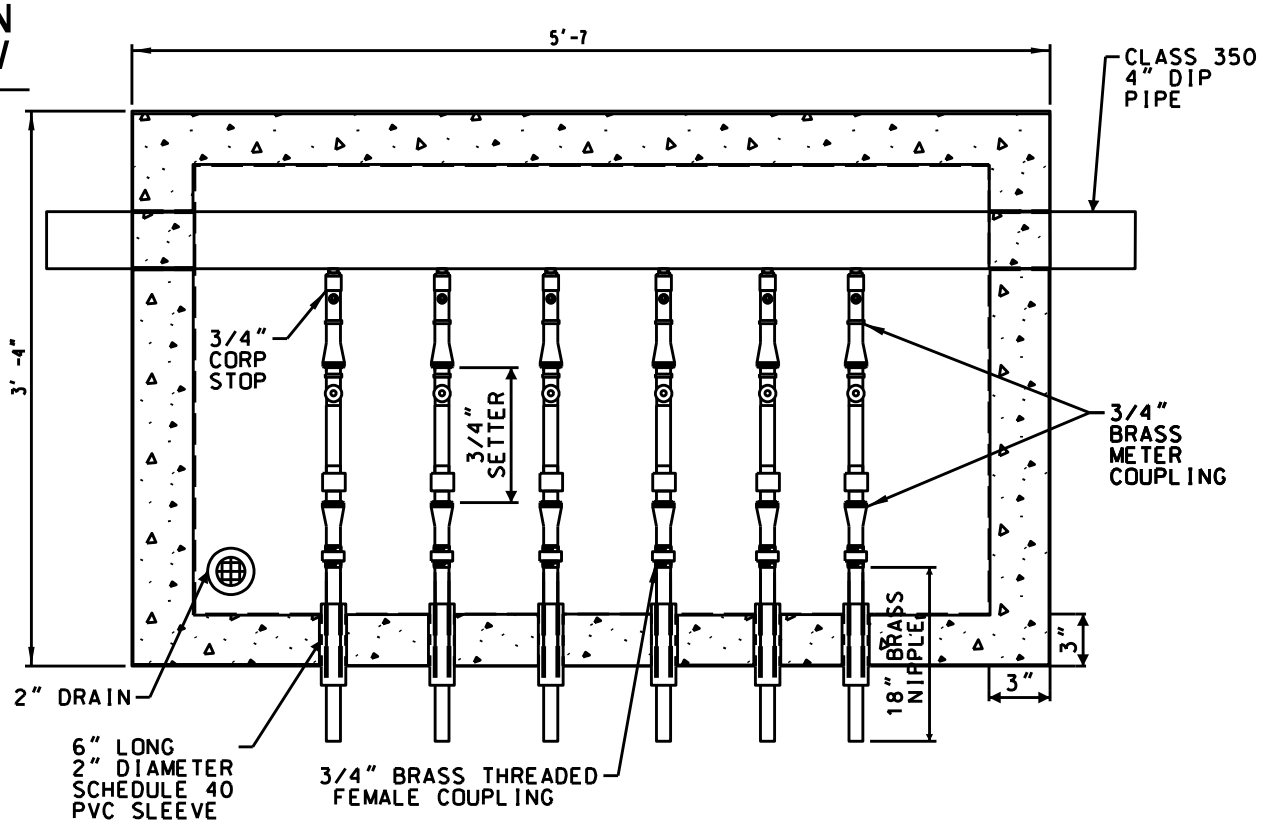
3. 3/4" BRASS THREADED FEMALE COUPLING

4. 3/4" (18"LONG) BRASS NIPPLE

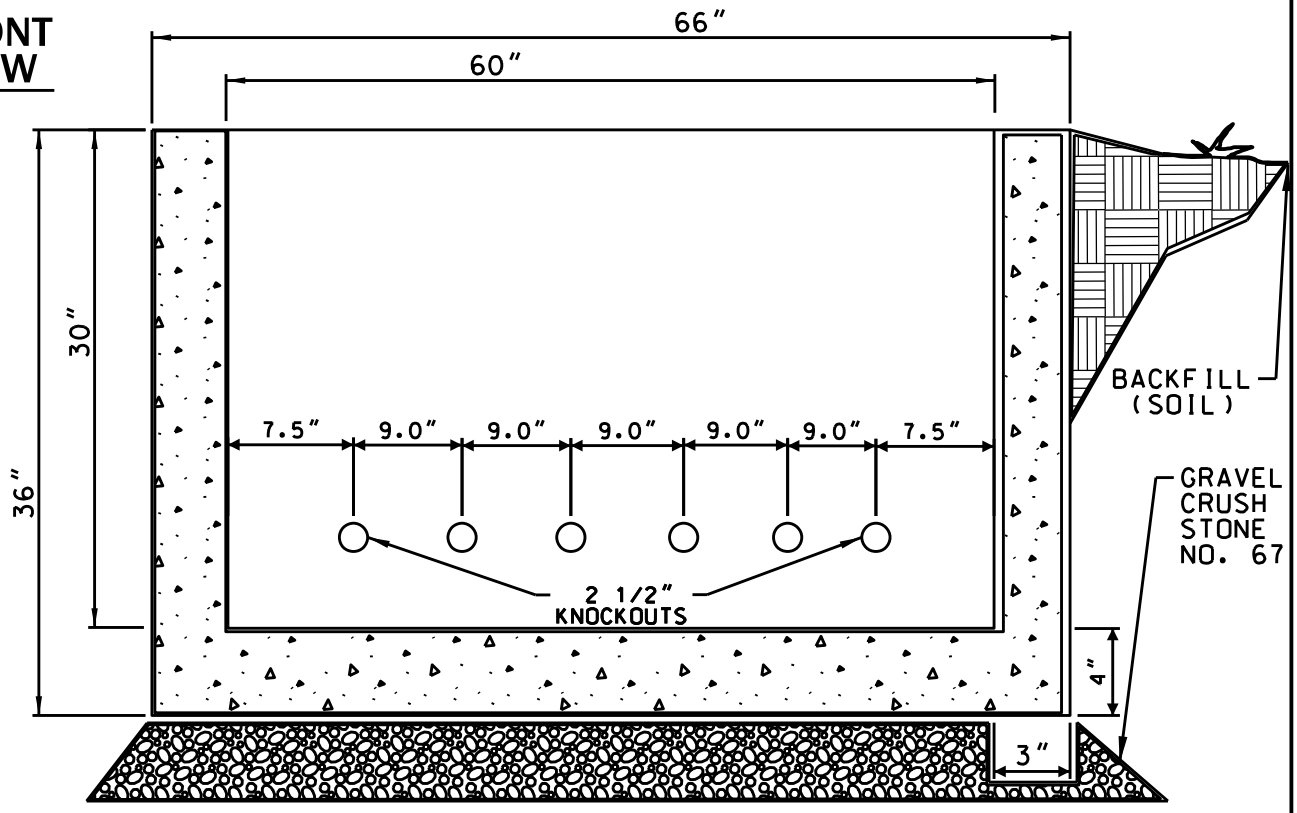
5. 3/4" CORPERATION STOP: FORD PART NO. FB-1600-3-NL OR APPROVED EQUAL.

FOUR(4) GANG 3/4" WATER METER VAULT (2 OF 2)

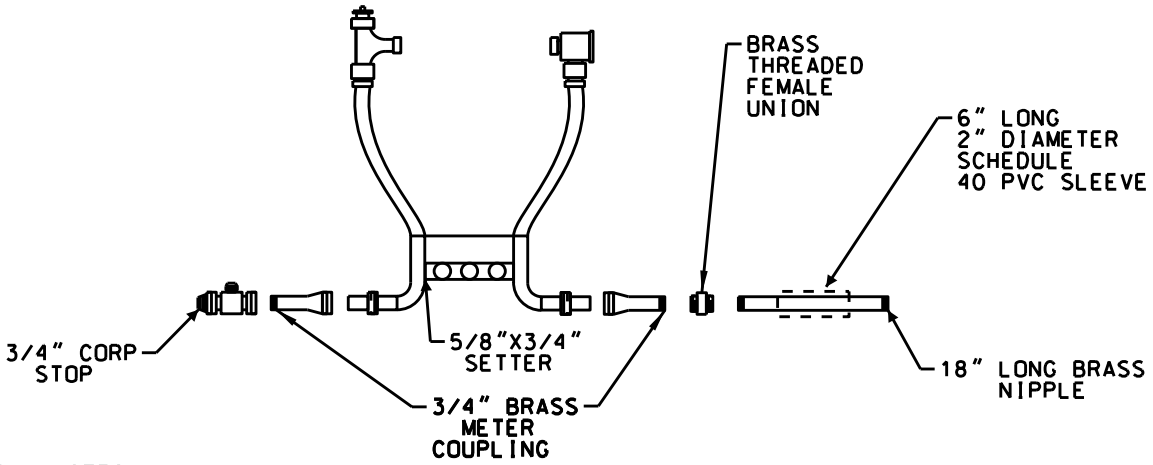
PLAN VIEW



FRONT VIEW



SIX (6) GANG 3/4" WATER METER VAULT (1 OF 2)



GENERAL NOTES:

1. VAULT SHALL BE A HOLTON CONCRETE VAULT OR AN APPROVED EQUAL. ALL CONCRETE VAULT CONCRETE SHALL HAVE A MINIMUM OF 4,000-psi. STRENGTH AND CURRED FOR 28-DAYS.

2. EACH VAULT SHALL HAVE A 2" DRAIN AT THE BASE OF THE VAULT.THE CONCRETE VAULT SHALL HAVE A 6" BEDDING OF GRAVEL (CRUSHED STONE NO. 67) ON THE BOTTOM OF THE VAULT. THE VAULT SHALL BE INSTALLED 3"-6" ABOVE FINISHED GRADE WITH GOOD SOIL/DIRT SLOPE AWAY FROM THE EDGE OF THE VAULT ON EACH OF IT'S SIDES.

3. VAULT HATCH SHALL BE FULL SIZE ALUMINUM LID HALLIDAY MODEL OR AN APPROVED EQUAL. THE HATCH SHALL HAVE 2" THICK WEATHER PROOF AND WATER RESISTANT INSULATION GLUED TO THE BOTTOM OF THE LID. THE GLUE AND/OR ADHESIVE SHALL BE WEATHER PROOF AND WATER RESISTANT. THE VAULT HATCH SHALL BE BOLTED TO THE CONCRETE VAULT.

4. AN ANTENNA HOLE IS TO BE CUT FOR EACH METERS' ITRON ENDPOINT.

5. THE WATER SERVICE MAIN SHALL BE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

6. ALL WATER SERVICES ARE TO USE A DIRECT TAP INTO THE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

7. CONCRETE VAULT TO MEET THE CURRENT REQUIREMENTS OF ASTM C857 AND C858 FOR STRUCTUAL DESIGN AND LOADINGS.

8. EACH WATER SERVICE SHALL HAVE AN 18" BRASS NIPPLE. WHICH IS SLEEVE THROUGH THE VAULTS WALL WITH A 6" LONG PIECE OF 2" PVC SCHEDULE 40 PIPE. THE SLEEVE IS TO BE GREAT FOAMED AT INSIDE AND OUTSIDE OF THE VAULT.

9. EACH WATER SERVICE ASSEMBLY SHALL BE HYDROSTATICLY PRESSURE TESTED AFTER BEING ASSEMBLIED AT 150-psi. FOR ONE (1) HOUR. HYDROSTATIC PRESSURE SHALL BE CERTIFIED WITH CERTIFICATE OF COMPLETION.

10. ALL WATER SERVICE ASSEMBLIES SHALL BE INSTALLED FROM THE SECOND MIDDLE KNOCKOUT HOLE WITHIN THE VAULT. THE WATER SERVICE ASSEMBLIES SHALL HAVE AN EVEN AMOUNT OF ASSEMBLIES FROM THE CENTER OF THE CONCRETE VAULT.

PARTS LIST:

1. 5/8"X3/4"X7" WATER METER SETTER: FORD PART NO. VBHH42-7WR-NL OR MUELLER PART NO. 234B2418R5-N OR APPROVED EQUAL

2. 3/4" BRASS METER COUPLING: FORD PART NO. C38-23-2-5-NL OR APPROVED EQUAL.

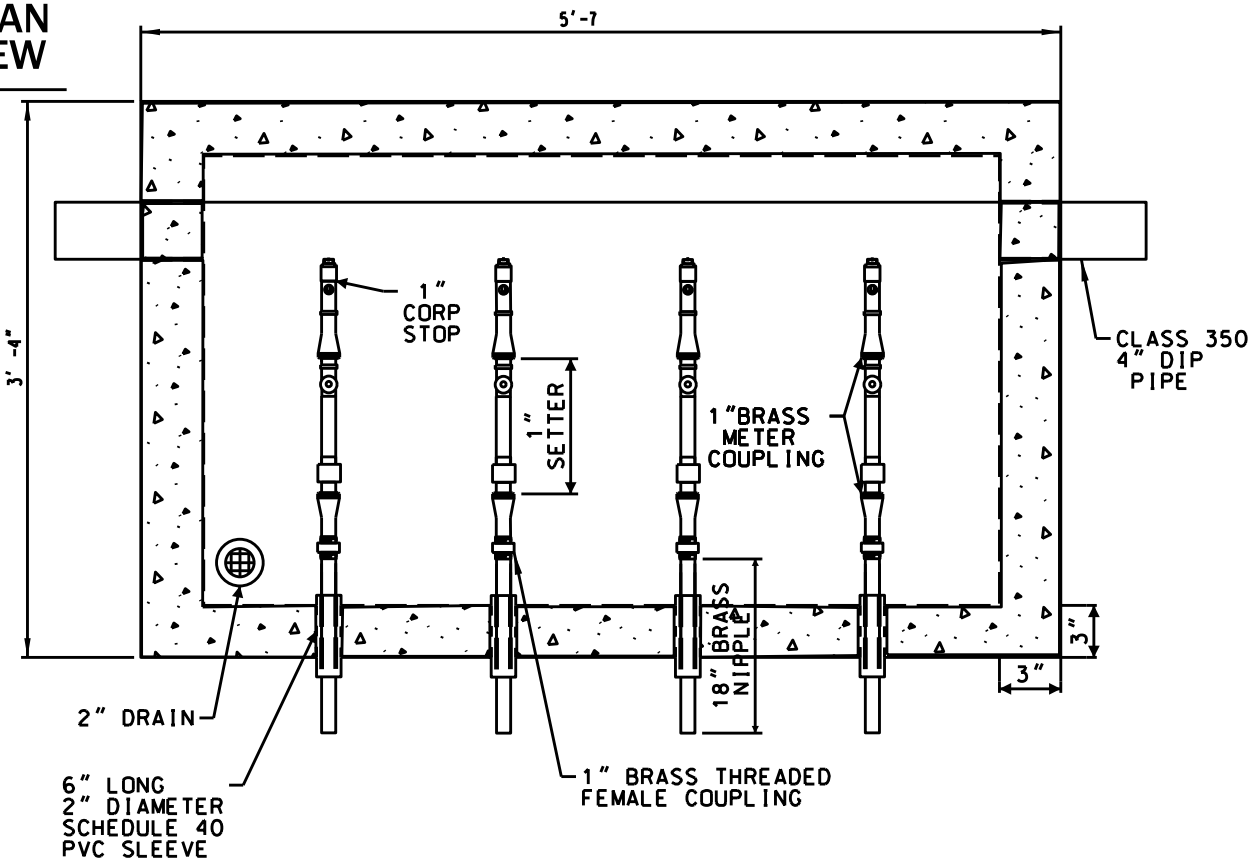
3. 3/4" BRASS THREADED FEMALE COUPLING

4. 3/4" (18"LONG) BRASS NIPPLE

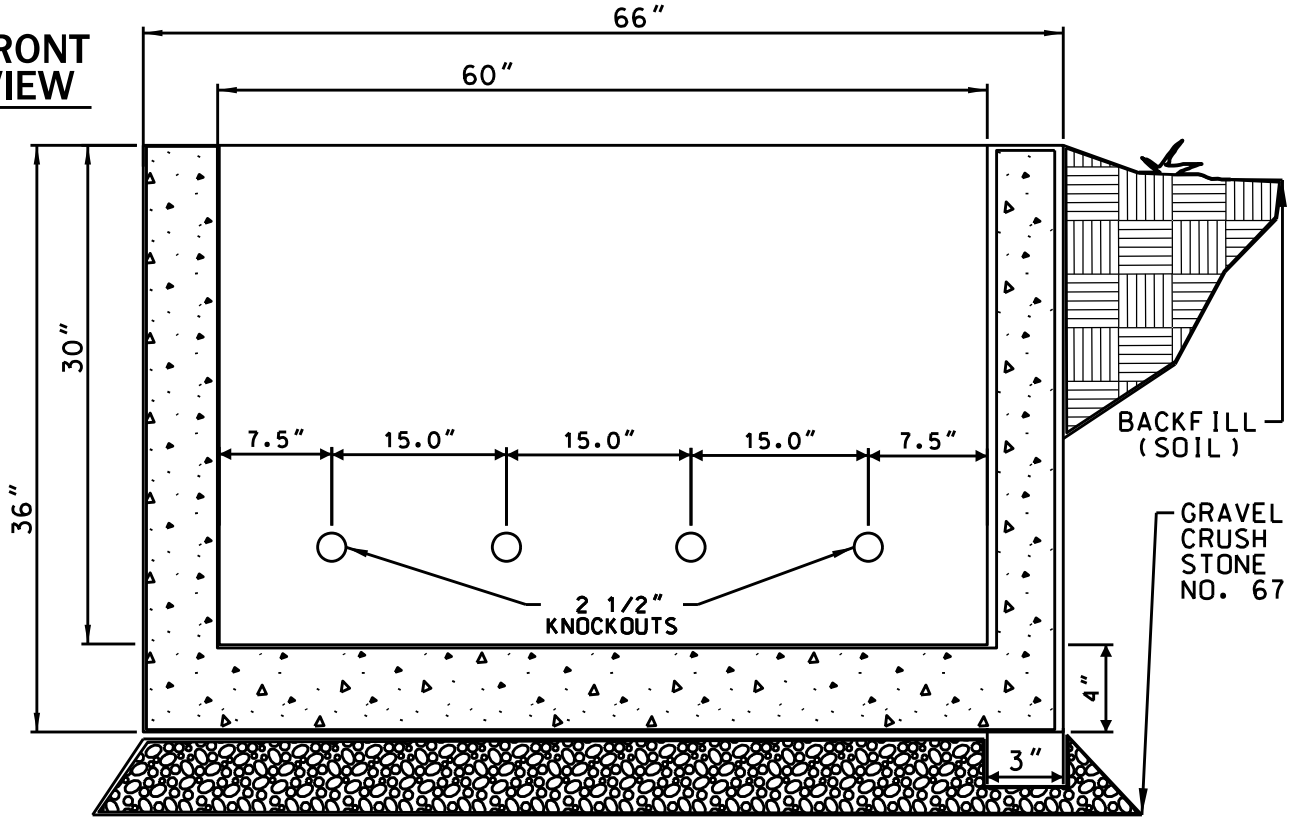
5. 3/4" CORPERATION TOP: FORD PART NO. FB-1600-3-NL OR APPROVED EQUAL.

SIX (6) GANG 3/4" WATER METER VAULT (2 OF 2)

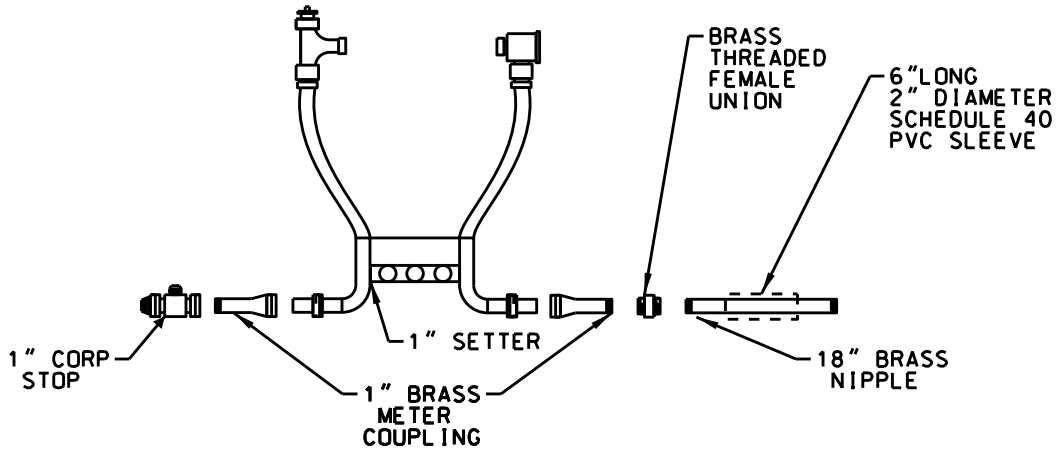
PLAN VIEW



FRONT VIEW



FOUR (4) GANG 1" WATER METER VAULT (1 OF 2)



GENERAL NOTES:

1. VAULT SHALL BE A HOLTON CONCRETE VAULT OR AN APPROVED EQUAL. ALL CONCRETE VAULT CONCRETE SHALL HAVE A MINIMUM OF 4,000-psi. STRENGTH AND CURRED FOR 28-DAYS.

2. EACH VAULT SHALL HAVE A 2" DRAIN AT THE BASE OF THE VAULT. THE CONCRETE VAULT SHALL HAVE A 6" BEDDING OF GRAVEL (CRUSHED STONE NO. 67) ON THE BOTTOM OF THE VAULT. THE VAULT SHALL BE INSTALLED 3"-6" ABOVE FINISHED GRADE WITH GOOD SOIL/DIRT SLOPE AWAY FROM FROM THE EDGE OF THE VAULT ON EACH OF IT'S SIDES.

3. VAULT HATCH SHALL BE FULL SIZE ALUMINUM LID HALLIDAY MODEL OR AN APPROVED EQUAL. THE HATCH SHALL HAVE 2" THICK WEATHER PROOF AND WATER RESISTANT INSULATION GLUED TO THE BOTTOM OF THE LID. THE GLUE AND/OR ADHESIVE SHALL BE WEATHER PROOF AND WATER RESISTANT. THE VAULT HATCH SHALL BE BOLTED TO THE CONCRETE.

4. AN ANTENNA HOLE IS TO BE CUT FOR EACH METERS' ITRON ENDPOINT.

5. THE WATER SERVICE MAIN SHALL BE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

6. ALL WATER SERVICES ARE TO USE A DIRECT TAP INTO THE 4" CLASS 350 DUCTILE IRON PIPE (DIP).

7. CONCRETE VAULT TO MEET THE CURRENT REQUIREMENTS OF ASTM C857 AND C858 FOR STRUCTUAL DESIGN AND LOADINGS.

8. EACH WATER SERVICE SHALL HAVE AN 18" BRASS NIPPLE. WHICH IS SLEEVE THROUGH THE VAULTS WALL WITH A 6" LONG PIECE OF 2" PVC SCHEDULE 40 PIPE. THE SLEEVE IS TO BE GREAT FOAMED AT INSIDE AND OUTSIDE OF THE VAULT.

9. EACH WATER SERVICE ASSEMBLY SHALL BE HYDROSTATICLY PRESSURE TESTED AFTER BEING ASSEMBLIED AT 150-psi. FOR ONE (1) HOUR. HYDROSTATIC PRESSURE SHALL BE CERTIFIED WITH CERTIFICATE OF COMPLETION.

10. ALL WATER SERVICE ASSEMBLIES SHALL BE INSTALLED FROM THE SECOND MIDDLE KNOCKOUT HOLE WITHIN THE VAULT. THE WATER SERVICE ASSEMBLIES SHALL HAVE AN EVEN AMOUNT OF ASSEMBLIES FROM THE CENTER OF THE CONCRETE VAULT.

PARTS LIST:

1. 1" WATER METER SETTER: FORD PART NO. VBHH44-10-NL OR APPROVED EQUAL

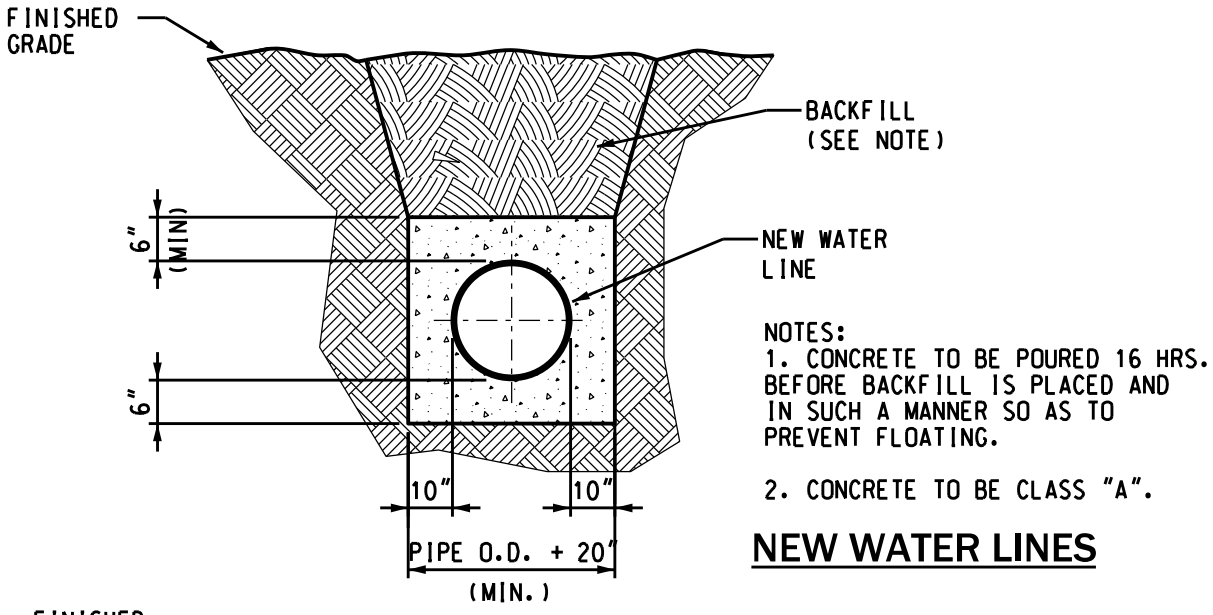
2. 1" BRASS METER COUPLING: FORD PART NO. C38-44-2-625-NL OR APPROVED EQUAL.

3. 1" BRASS THREADED FEMALE COUPLING

4. 1" (18"LONG) BRASS NIPPLE

5. 1" CORPERATION TOP: FORD PART NO. FB1600-4-NL OR APPROVED EQUAL.

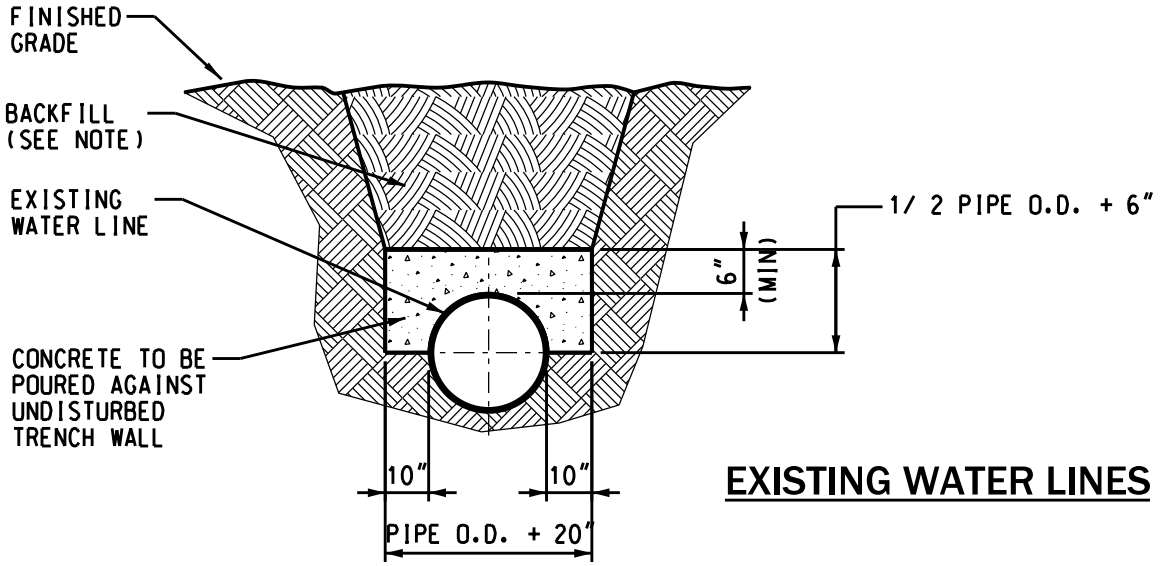
FOUR(4) GANG 1" WATER METER VAULT (2 OF 2)



NOTES:
1. CONCRETE TO BE POURED 16 HRS. BEFORE BACKFILL IS PLACED AND IN SUCH A MANNER SO AS TO PREVENT FLOATING.

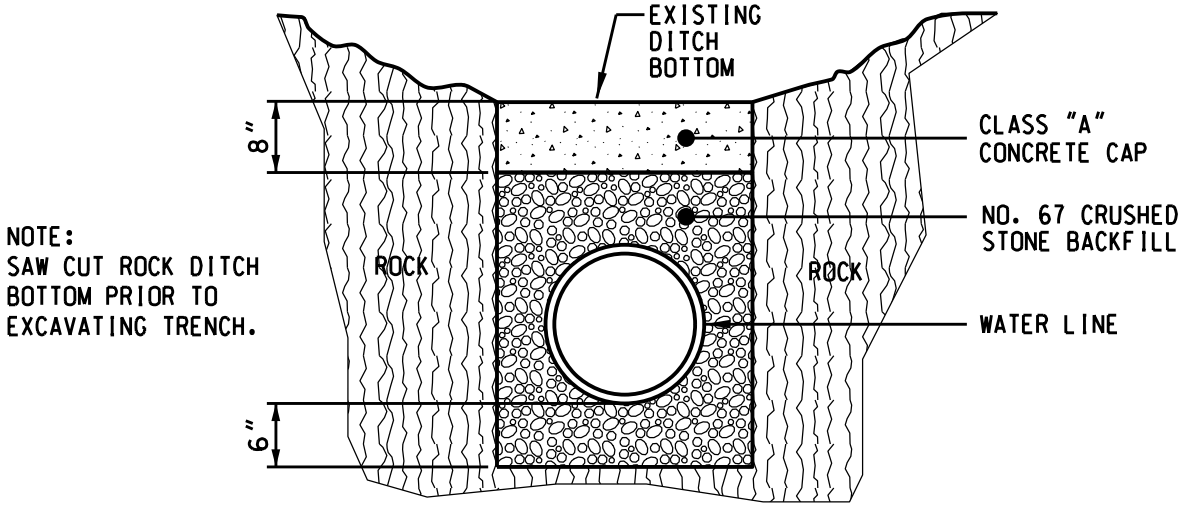
2. CONCRETE TO BE CLASS "A".

NEW WATER LINES



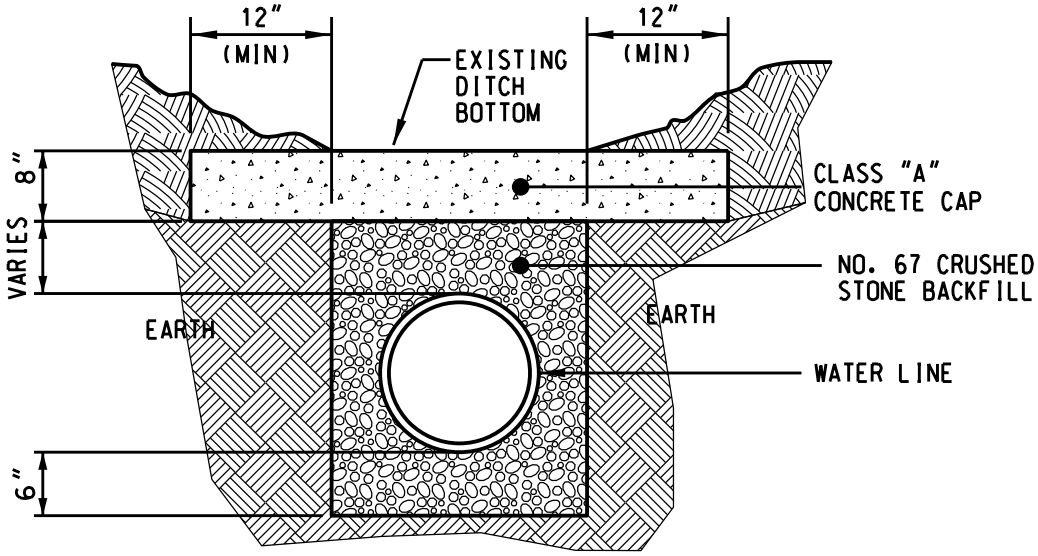
EXISTING WATER LINES

CONCRETE ENCASEMENT FOR WATER LINES



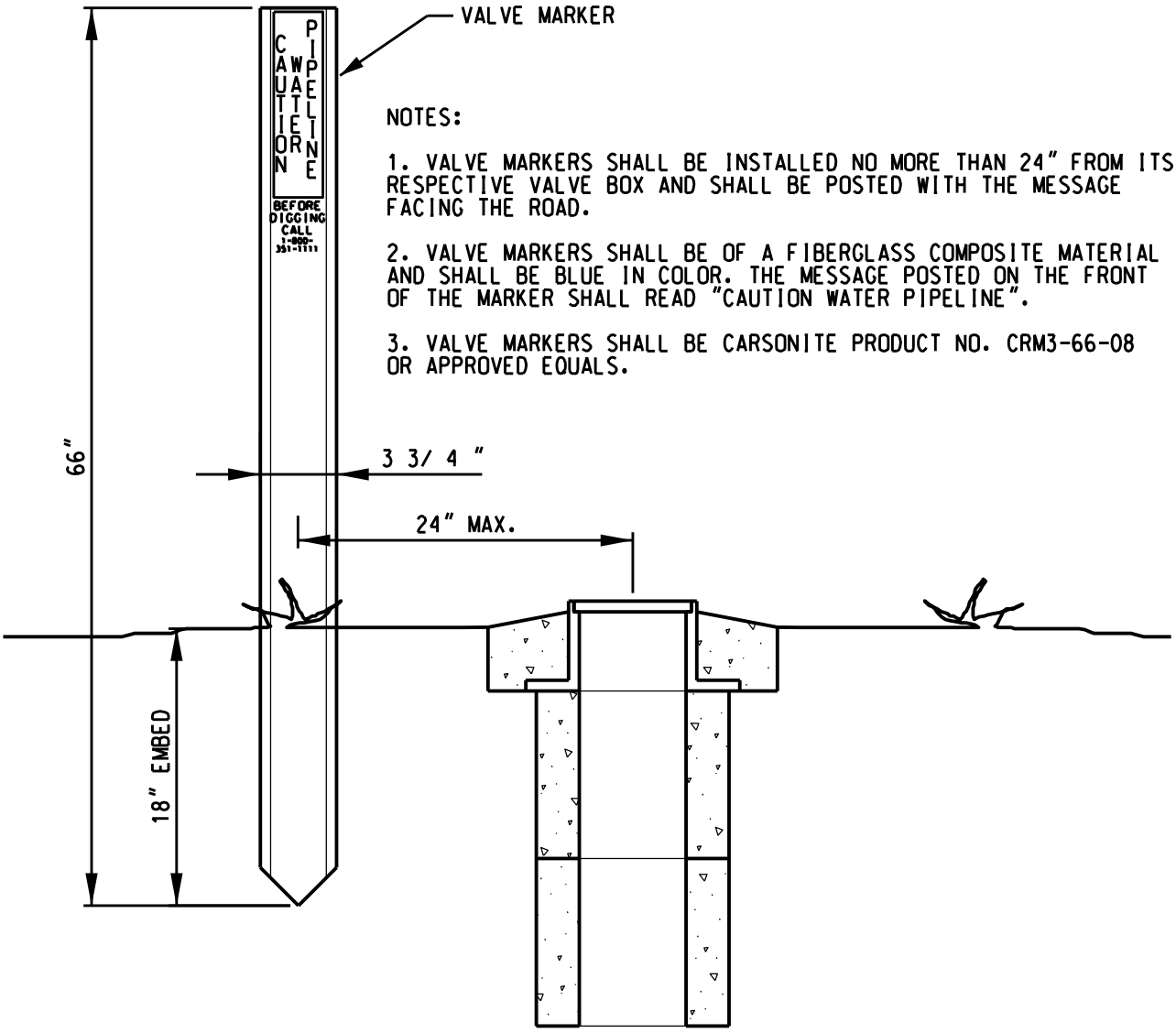
NOTE:
SAW CUT ROCK DITCH BOTTOM PRIOR TO EXCAVATING TRENCH.

ROCK EXCAVATION



EARTH EXCAVATION

CONCRETE CAP DETAIL



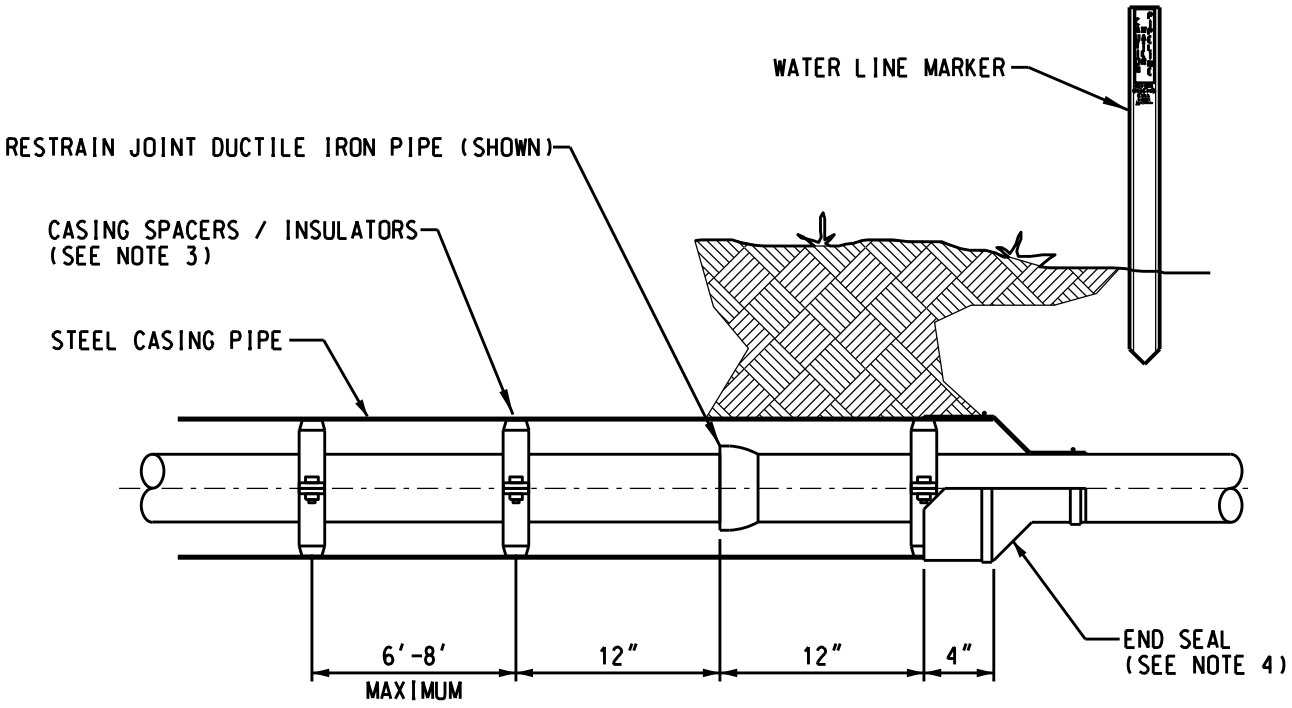
NOTES:

1. VALVE MARKERS SHALL BE INSTALLED NO MORE THAN 24" FROM ITS RESPECTIVE VALVE BOX AND SHALL BE POSTED WITH THE MESSAGE FACING THE ROAD.

2. VALVE MARKERS SHALL BE OF A FIBERGLASS COMPOSITE MATERIAL AND SHALL BE BLUE IN COLOR. THE MESSAGE POSTED ON THE FRONT OF THE MARKER SHALL READ "CAUTION WATER PIPELINE".

3. VALVE MARKERS SHALL BE CARSONITE PRODUCT NO. CRM3-66-08 OR APPROVED EQUALS.

WATER VALVE MARKER DETAIL



SECTION VIEW

NOTES:

1. ALL STEEL CASING PIPE SHALL BE ASTM A252, GRADE B.

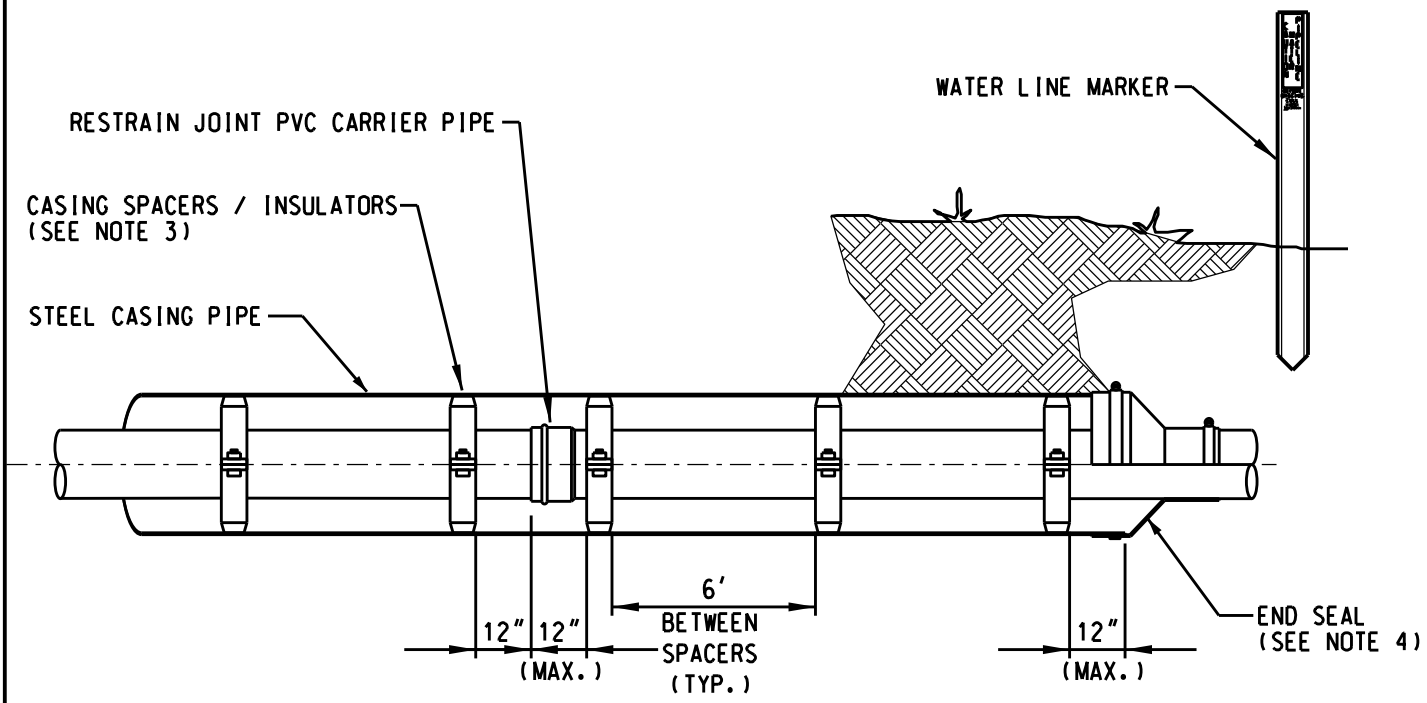
2. ALL CASING PIPE LOCATIONS AND THEIR ALIGNMENTS SHALL BE IDENTIFIED WITH WATER LINE MARKERS. TWO MARKERS SHALL BE INSTALLED WITH EACH CASING PIPE-ONE AT EACH END. THE MARKERS SHALL BE INSTALLED IN-LINE WITH THE CASING PIPE IN UNOBSTRUCTIVE AND UNINTRUSIVE LOCATIONS.

3. STAINLESS STEEL SPACERS / INSULATORS SHALL BE INSTALLED WITH DUCTILE IRON CARRIER PIPE. POLYETHYLENE SPACER / INSULATOR SHALL BE INSTALL WITH PVC CARRIERS PIPE. SPACER / INSULATORS SHALL BE ADVANCE PRODUCTS & SYSTEMS, INC.

4. PULL-ON END SEALS SHALL BE INSTALLED AT EACH END OF EACH STEEL CASING PIPE. END SEALS SHALL BE ADVANCE PRODUCTS & SYSTEMS MODEL AC OR APPROVED EQUAL.

5. CARRIER PIPE JOINTS INSIDE THE CASING PIPE SHALL BE INSTALLED WITH RESTRAINING GASKETS.

CASING PIPE DETAIL



SECTION VIEW

NOTES:

1. ALL STEEL CASING PIPE SHALL BE ASTM A139, GRADE B.

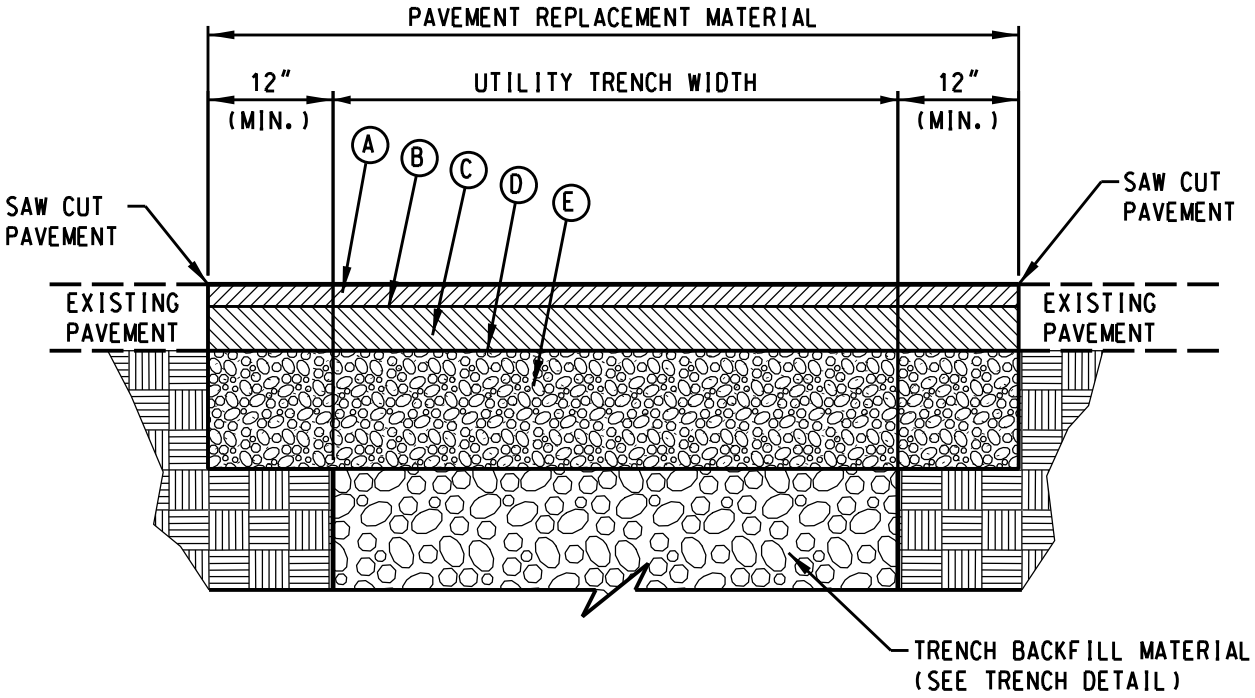
2. ALL CASING PIPE LOCATIONS AND THEIR ALIGNMENTS SHALL BE IDENTIFIED WITH WATER LINE MARKERS. TWO MARKERS SHALL BE INSTALLED WITH EACH CASING PIPE-ONE AT EACH END. THE MARKERS SHALL BE INSTALLED IN-LINE WITH THE CASING PIPE IN UNOBSTRUCTIVE AND UNINTRUSIVE LOCATIONS.

3. POLYETHYLENE SPACER / INSULATORS SHALL BE INSTALL WITH PVC CARRIERS PIPE. SPACER / INSULATORS SHALL BE ADVANCE PRODUCTS & SYSTEMS, INC.

4. PULL-ON END SEALS SHALL BE INSTALLED AT EACH END OF EACH STEEL CASING PIPE. END SEALS SHALL BE ADVANCE PRODUCTS & SYSTEMS MODEL AC OR APPROVED EQUAL.

5. CARRIER PIPE JOINTS INSIDE THE CASING PIPE SHALL BE INSTALLED WITH RESTRAINING GASKETS OR BELL RETRAINT HARNESS.

CASING PIPE W/ PVC CARRIER PIPE DETAIL



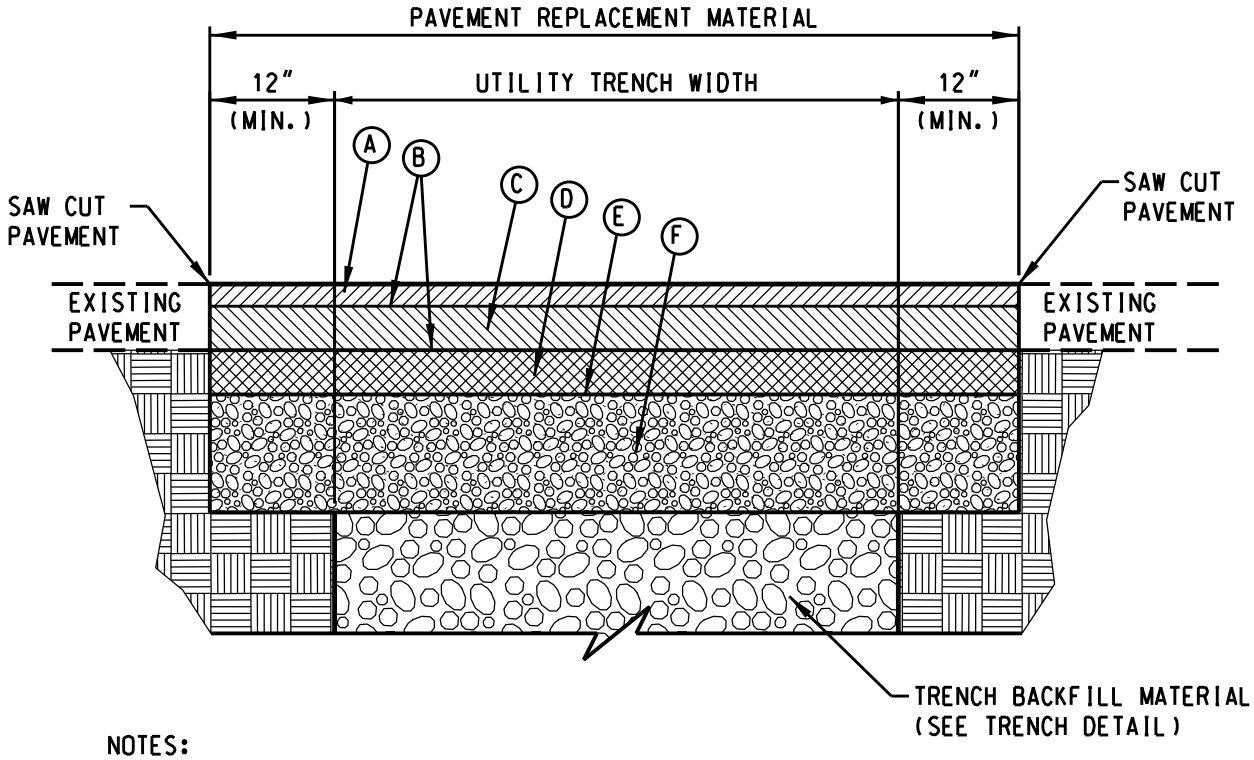
NOTES:

1. THIS DETAIL APPLIES TO ALL TOWN STREETS DESIGNATED AS RESIDENTIAL MINOR, RESIDENTIAL COLLECTOR, NON-RESIDENTIAL MINOR AND NON-RESIDENTIAL COLLECTOR.

2. PAVEMENT SCHEDULE:

A 1 1/ 2" THICK (APPROX. 165 LBS./S.Y.) ASPHALTIC CONCRETE SURFACE (307-CW).
B. BITUMINOUS MATERIAL FOR TACK COAT (403-01) @ 0.10 GAL./S.Y.
C. 3" THICK (APPROX. 339 LBS./S.Y) ASPHALTIC CONCRETE BASE (307-B MODIFIED).
D. BITUMINOUS MATERIAL FOR PRIME COAT (402-01) @ 0.30 GAL./S.Y.
E. 8" THICK 303-01 MINERAL AGGREGATE TYPE "A", GRADING "D" COMPACTED TO 97% STANDARD PROCTOR DENSITY.

PAVEMENT REPLACEMENT DETAIL (TOWN STREETS)



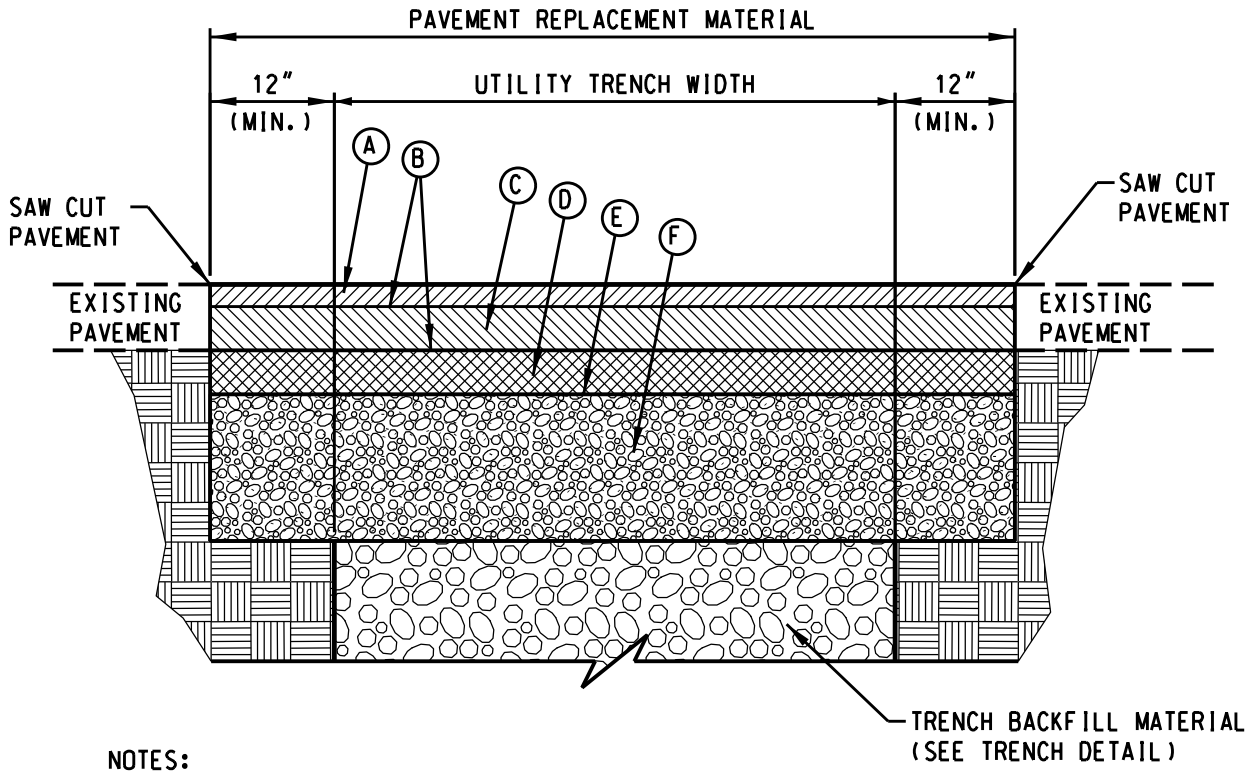
NOTES:

1. THIS DETAIL APPLIES TO ALL TOWN STREETS DESIGNATED AS RESIDENTIAL ARTERIAL.

2. PAVEMENT SCHEDULE:

A 1 1/ 2" THICK (APPROX. 165 LBS./S.Y.) ASPHALTIC CONCRETE SURFACE (307-CW).
B. BITUMINOUS MATERIAL FOR TACK COAT (403-01) @ 0.10 GAL./S.Y.
C. 3" THICK (APPROX. 339 LBS./S.Y) ASPHALTIC CONCRETE BASE (307-B MODIFIED).
B. BITUMINOUS MATERIAL FOR TACK COAT (403-01) @ 0.10 GAL./S.Y.
D. 3" THICK (APPROX. 345 LBS./S.Y) ASPHALTIC CONCRETE BASE (307-A MIX).
E. BITUMINOUS MATERIAL FOR PRIME COAT (402-01) @ 0.30 GAL./S.Y.
F. 8" THICK 303-01 MINERAL AGGREGATE TYPE "A", GRADING "D" COMPACTED TO 97% STANDARD PROCTOR DENSITY.

PAVEMENT REPLACEMENT DETAIL (RESIDENTIAL ARTERIAL)



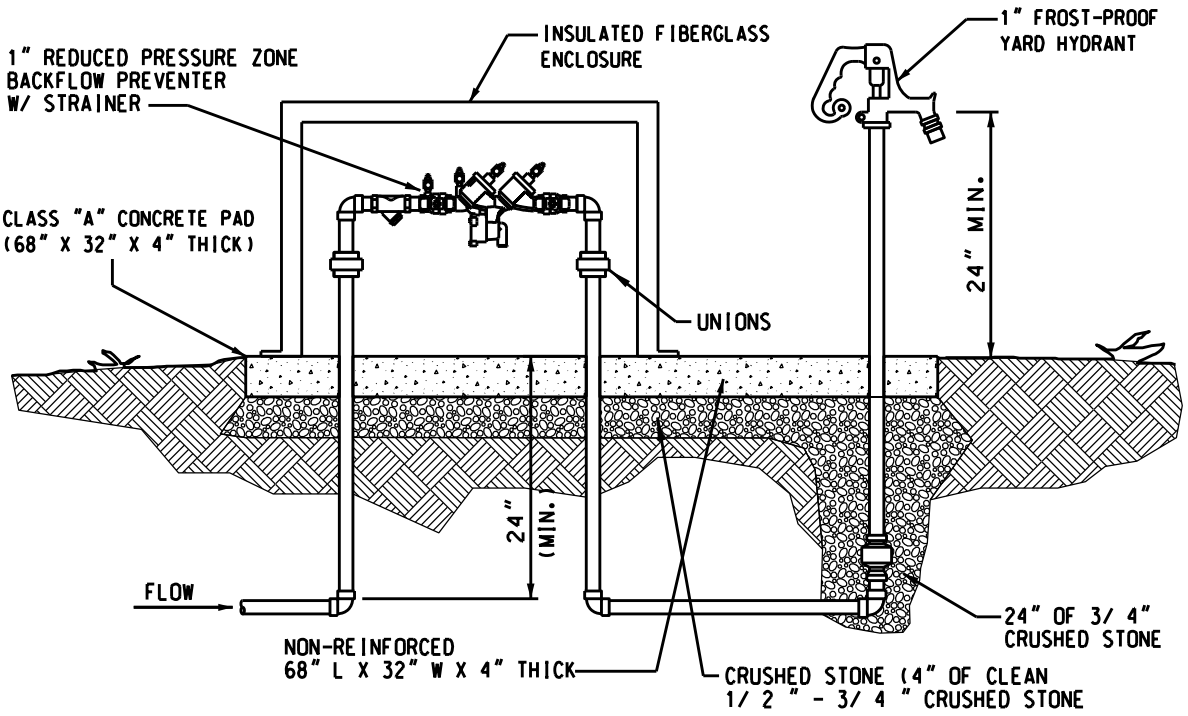
NOTES:

1. THIS DETAIL APPLIES TO ALL TOWN STREETS DESIGNATED AS NON-RESIDENTIAL ARTERIAL.

2. PAVEMENT SCHEDULE:

A 1 1/ 2" THICK (APPROX. 165 LBS./S.Y.) ASPHALTIC CONCRETE SURFACE (307-CW).
B. BITUMINOUS MATERIAL FOR TACK COAT (403-01) @ 0.10 GAL./S.Y.
C. 3" THICK (APPROX. 339 LBS./S.Y) ASPHALTIC CONCRETE BASE (307-B MODIFIED).
B. BITUMINOUS MATERIAL FOR TACK COAT (403-01) @ 0.10 GAL./S.Y.
D. 3" THICK (APPROX. 345 LBS./S.Y) ASPHALTIC CONCRETE BASE (307-A MIX).
E. BITUMINOUS MATERIAL FOR PRIME COAT (402-01) @ 0.30 GAL./S.Y.
F. 10" THICK 303-01 MINERAL AGGREGATE TYPE "A", GRADING "D" COMPACTED TO 97% STANDARD PROCTOR DENSITY.

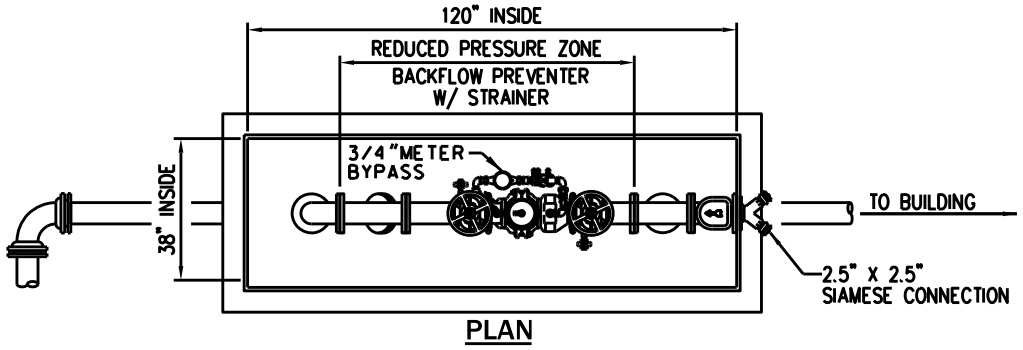
PAVEMENT REPLACEMENT DETAIL (NON-RESIDENTIAL ARTERIAL)



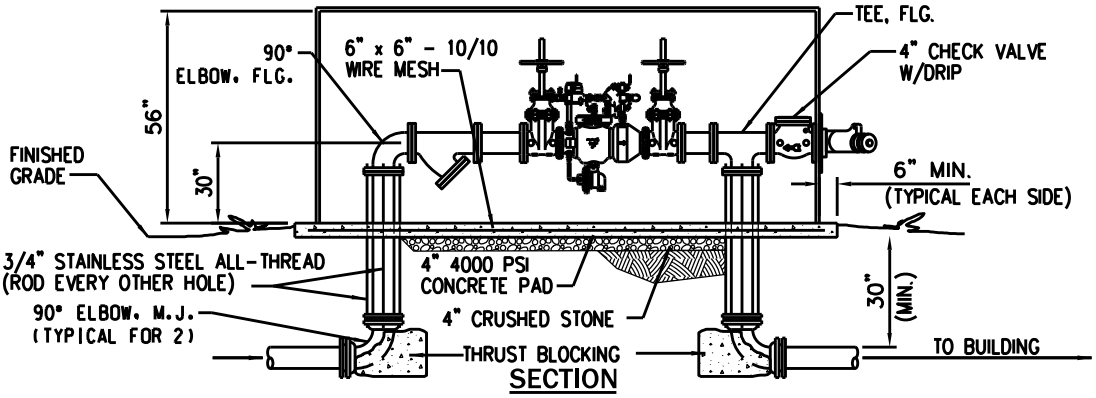
NOTES:

1. CONCRETE PAD TO BE CLASS "A" CONCRETE.
2. BACKFLOW PREVENTER TO BE WILKINS REGULATOR SERIES 975XL2 OR APPROVED EQUAL.
3. YARD HYDRANT TO BE SIMMONS MODEL 812LF OR APPROVED EQUAL.
4. ENCLOSURE TO BE HOT BOX MODEL Hb1.5 FLIP TOP W/ 60 WATT HEATER.THE HEATER AND ANY ELECTRICAL POWER SOURCE SHALL NOT BE PLACE UNDER THE RELIEF VALVE.
5. PIPE TO BE TYPE "K" RIGID COPPER PIPE WITH SOLDERED FITTINGS. ADDITIONAL FITTINGS MAY BE REQUIRED.
6. ALL TEST FITTINGS ARE REQUIRED TO BE IN THE TEST COCK OF THE BACKFLOW.
7. THERE MUST BE A MINIMUM OF 12-IN. OF SPACE FROM THE BOTTOM OF THE RELIEF VALVE TO THE CONCRETE FOOTING.
8. ALL BACKFLOWS ARE REQUIRED TO HAVE UNIONS.
9. ALL BACKFLOWS ARE REQUIRED TO BE PLACED OUTSIDE IN A HOT BOX.

1" REDUCED PRESSURE ZONE (RPZ) BACKFLOW PREVENTER DETAIL



PLAN



SECTION

REDUCED PRESSURE ZONE (RPZ) BACKFLOW PREVENTER WITH 3/4" METER BYPASS DETAIL (1 of 2)

GENERAL NOTES:

1. THE ENCLOSURE SHALL BE AQUASHIELD BACKFLOW PREVENTERS NO. BFP6-NS WITH HEATER OR APPROVED EQUAL.THE HEATER AND ANY ELECTRICAL POWER SOURCE SHALL NOT BE PLACE UNDER THE RELIEF VALVE.

2. ALL APPLICABLE COMPONENTS OF THE FIRE LINE SHALL BE UL/FM LISTED PER NFPA 24.

3. THE REDUCED PRESSURE ZONE BACKFLOW PREVENTER SHALL BE WILKINS REGULATOR MODEL OR APPROVED EQUAL.

4. THE SIAMESE CONNECTION SHALL BE POTTER-ROEMER MODEL 5751 OR APPROVED EQUAL.

5. THE CHECK VALVE SHALL BE MUELLER NO. A-2120-6BB OR APPROVED EQUAL. IT SHALL BE UL / FM LISTED.

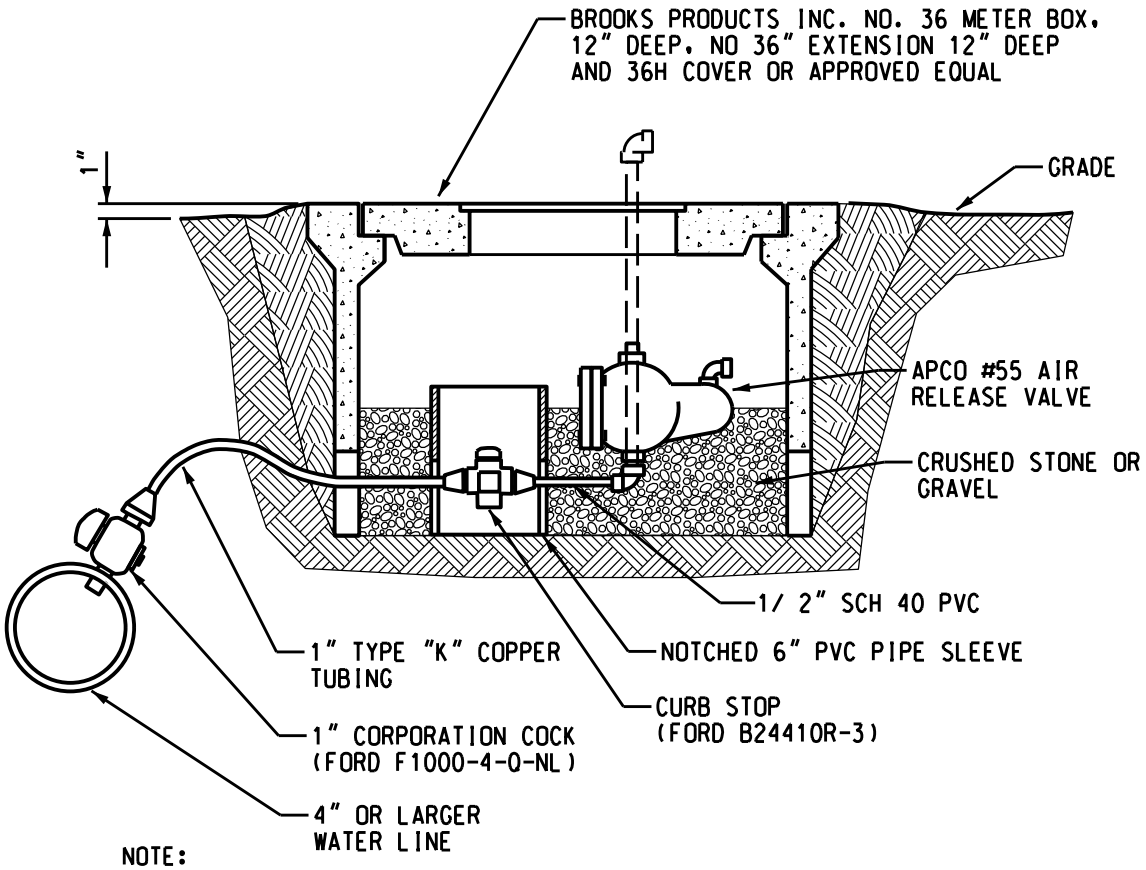
6. THERE MUST BE A MINIMUM OF 12-IN OF SPACE FROM THE BOTTOM OF THE PIPE TO THE CONCRETE FOOTING.

7. THE 3/4 INCH METER BYPASS SHALL BE A BADGER M25 WATER METER WITH AN ITRON CONNECTOR.

8. ALL BACKFLOWS ARE REQUIRED TO BE PLACED OUTSIDE IN A HOT BOX.

9. CONCRETE FOR THE CONCRETE THRUST BLOCK MUST BE POURED FROM A TRUCK WITH THE MINIMUM COMPRESSION STRENGTH OF 3000-PSI.

REDUCED PRESSURE ZONE (RPZ) BACKFLOW PREVENTER WITH 3/4" METER BYPASS DETAIL (2 of 2)

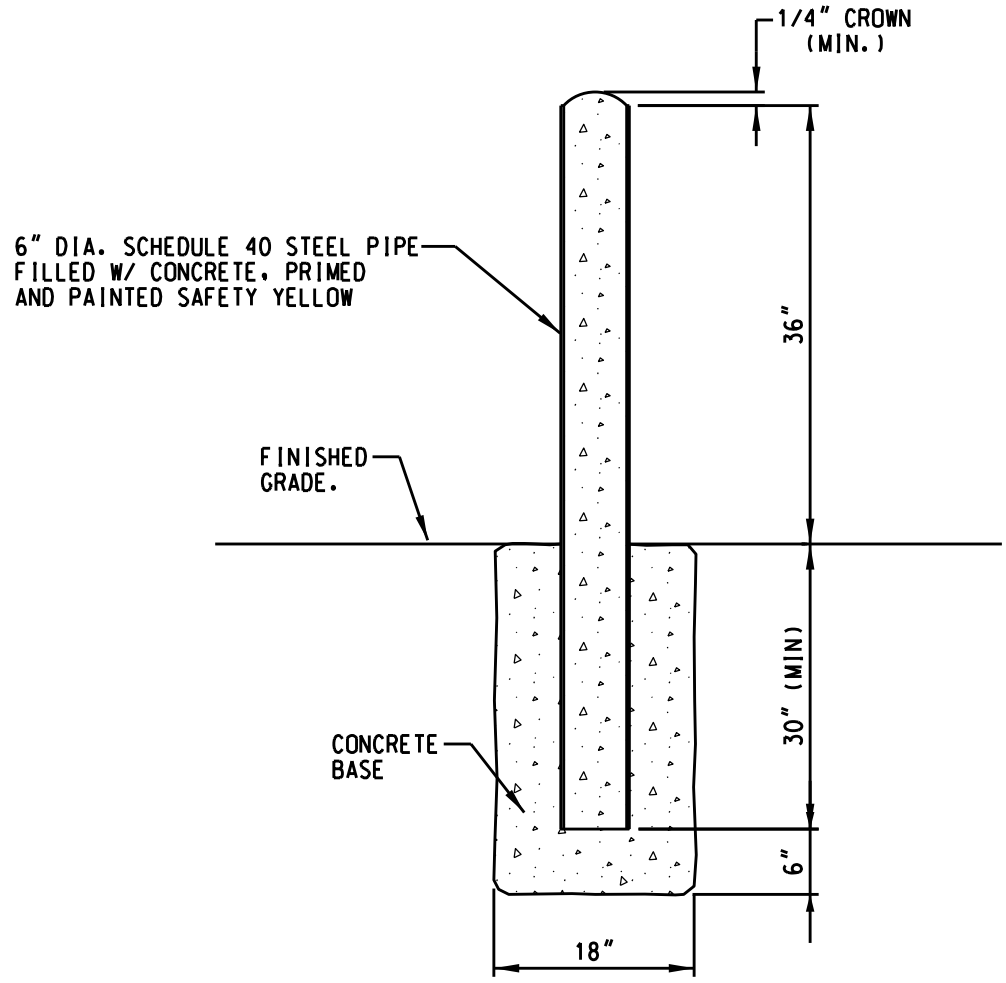


NOTE:

1. AUTOMATIC AIR RELEASE SHOWN. FOR MANUAL OPERATION, OMIT APCO VALVE AND SUBSTITUTE 1/ 2 " THREADED NIPPLE W/ELBOW (SHOWN DASHED).

2. THE APCO #55 HAS A WORKING PRESSURE OF UP TO 200 PSI.

1/2" AUTOMATIC AIR RELEASE ASSEMBLY



PIPE BOLLARD DETAIL

SD-1.6

PRE-CONSTRUCTION MEETING CHECKLIST

Development:_____

Location:_____

Contractor:_____

____ 1. Water and Sewer Specification books are available to view or download at www.townofsmyrna.org. Under the departments tab, click on Utilities. For subdivision, click on Planning & Zoning.

____ 2. Contractor must have state approved plans for water and sewer on the job site at all times. The operation hours for all construction projects shall be Monday through Friday from 7am to 6pm, Saturdays from 8am to 6pm, and no work shall be done on Sundays.

____ 3. Square Valve boxes only are permitted, instead of round.

____ 4. The Town of Smyrna uses MJ tapping sleeves only (Mueller H-615 or approved equal). All tapping sleeves shall be hydrostatically tested at 200 psi for two (2) hours.

____ 5. Fire hydrants shall be Mueller Super Centurion 250 or M&H Valve Model 129.

____ 6. Fireline backflows shall be a Wilkins Regulator Model reduced pressure backflow preventer (or an approved equal) with a $^{3}/_{4}$" Badger water meter bypass with an Itron connection. All backflows are required to be placed outside in a hot box.

____ 7. The sewer cleanout shall be 6" SDR-26 or approved equal. In non-traffic areas, the cleanout shall be in 36H concrete box with a cast iron lid marked "SEWER" for a 36H box or approved equal. In traffic rated areas, a square JBS 8006 casting marked "SEWER" with a minimum 4" square concrete riser is to be installed.

____ 8. For sewer lines, PVC pipe will be SDR-26 for gravity lines and SDR-21 Class 200 for force mains; ductile iron pipes (DIP) will be Class 350 with Protecto 401 ceramic lining. For water lines, (4"-10") plastic PVC will be minimum AWWA C-900 (DR14) with a minimum pressure class of 200 psi. 12" and above water mains shall be Class 350 ductile iron pipe (DIP).

____ 9. 12 AWG gauge solid copper tracer wire is to be laid above the water line. Wire must be taped to the top of the water line and inside valve boxes. It is not to be wrapped around water valves in any way. Tracer shall be from the main to the meter (w/ 24" inside the box). 12 AWG gauge solid copper tracer wire is to be taped to the top of the sewer force main with metallic tape.

____ 10. Contractor will make water taps and verify the outer diameter of the existing main.

____ 11. Ends of all pipes are to be covered when on the jobsite at the end of day. Stored pipes must be protected from heat and sun. All faded or damaged pipes will not be used for installation.

____ 12. Bedding of gravel (crushed stone No. 67) on water and sewer shall be as follows: 6" on bottom and sides and 12" on top. All gravel envelopes for water & sewer main shall have its respective utilities tape laid on top. All water pipes shall have 30" of cover. All water service lines shall have the bedding of quarter down (dust). The water service line envelope shall be as follows: 6" on bottom and sides and 12" on top.

____ 13. In public roadways, the backfill shall consist entirely of crushed stone No. 67 TDOT approved. If in a new subdivision, revised regulations of Planning & Zoning dated July 2nd 2015 will be permitted.

____ 14. All manholes must have Xypex admix. Each barrel section is to be wrapped with mastic tape at each joint. No hydraulic cement or mortar shall be used to alter the inside of the manhole in any way. Non-shrink gout with Xypex admix is only to be used around the sewer pipe when it is placed into the invert of the manhole through the boot. Only 3 services are allowed to be installed in a manhole. The sewer service must be installed through a boot at the invert of the base.

____ 15. Manholes to be covered with a steel plate or casting with lid when set.

____ 16. Contractor must install check dams upstream of the downstream manhole after the sewer line crosses under the storm drain and/or a drain area.

____ 17. Contractor must call 24 hours minimum in advance to set up time and date with the Inspector for testing water and/or sewer. On all aspects of inspecting sewer and/or water lines, the Contractor must give the Inspector ample notice and time for all inspections (including testing, laying of lines, backfilling, etc.)

____ 18. Casting and Manhole will be vacuum tested as one unit. If the casting has been removed from the concrete manhole in any manner the casting and manhole will be vacuum tested again.

____ 19. A camera inspection at contractor expense of the sewer mains and laterals must be done prior to binder of the proposed roads or paved area.

____ 20. Smyrna Inspector shall issue a sewer line strainer with serialized ID tag. Contractor shall submit all test plugs for inspection. Each test plug shall be issued a serialized ID tag by Smyrna Inspector. After testing all ID tags will be returned to the Smyrna Inspector. If a test plug or strainer is lost, the Contractor is responsible for all costs associated within the recovery.

____ 21. After final inspection, the Contractor will submit an Engineer stamped set of as-builts along with digital copies (.dwg-AutoCAD and .pdf) and a Letter of Completion requesting that the one year warranty period begins. For residential projects, THIS IS TO BE DONE BEFORE BUILDING PERMITS CAN BE ISSUED. For commercial projects, THIS IS TO BE DONE BEFORE A CERTIFICATE OF OCCUPANCY CAN BE ISSUED.

____ 22. The Town of Smyrna will not pay for testing equipment or construction incidentals.

____ 23. Town of Smyrna reserves the right to change the wording and the enforcement of any water or sewer specification without notification to the contractor.

_____

Town of Smyrna Representative Date

_____

Contractor Representative Date

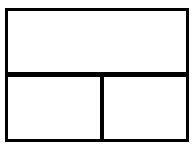
As-Built Checklist

On Plans:

1. Contact information
2. Subdivision name and section number
3. Plat Book and Page numbers
4. Lot numbers
5. (2) Dimensions to the following:
   a. Water meters
   b. Water valves
   c. Fire hydrants
   d. Storm drain features
   e. Sanitary cleanouts
   f. Above ground electrical or cable boxes
6. Stationing to the following:
   a. Manholes
   b. Sanitary tap locations from downstream manhole
   c. Offset length of sewer service
   d. Depth at end of sewer service

   Items b, c, and d should be as illustrated in Figure 1.

   Fig. 1.



7. Elevations to the following:
   a. Manholes
      1) Top-of-cast
      2) Invert to bottom, center
   b. Storm drain inlets top, center
   c. Plan and Profile are required for sanitary sewer, retention and detention areas.

In Field:

1. Blue paint on the water valve and at 90 degrees to the valve on the curb.
2. Dimensions should be kept as close to or under 100 ft. as much as possible. Dimension ties must be made to a semi-immovable item. Examples of semi-immovable items are manholes, power (light) poles, and storm drain headwalls. Where the determination is made that there is not an acceptable feature to dimension to, drill holes can be made and painted in the top-of-curb and measured to the feature.

CUSTOMER NAME
STREET ADDRESS
CITY, STATE, ZIP

RE: Backflow Device Testing and Inspection

Dear CUSTOMER NAME

Our records show that the annual testing and documentation deadline for your fire sprinkler backflow device(s) is due (DATE). Please provide a copy of the annual test results, as well as any maintenance or replacement records, to the Town of Smyrna Water Department ("the Water Department") on or before the deadline at the address below.

As you may know, the Water Department has the important obligation of protecting the public water supply from the risk of unsafe contamination resulting from backflow at points of cross-connection. This obligation is based on applicable provisions of the Tennessee Code as well as certain rules and regulations of the Tennessee Department of Environment and Conservation ("TDEC"). A cross-connection exists where the public water supply is connected, directly or indirectly, with any other water supply system or device which contains, or may contain, substances of unknown or unsafe quality, which may be capable of contaminating the public water supply as a result of backflow. TDEC requires annual testing of backflow devices for proper functioning.

Water Department personnel will only inspect and test backflow preventers on the domestic and irrigation water lines. Backflow preventers on fire sprinkler systems must be tested and serviced by a private contractor.

Beginning July 1, 2023, the Water Department plans to take the following steps to ensure compliance with the cross-connection testing requirement:

1. No penalty shall be accessed if backflow device test results are delivered to the Water Department on or before the annual testing deadline.
2. If the test results have not been received by the Water Department before the expiration of thirty calendar days after the annual testing deadline, then a $250.00 fee will be assessed and added to your monthly water bill.
3. If the backflow device test results have not been received by the Water Department before the expiration of 60 calendar days after the annual testing deadline, then an additional $500.00 fee will be assessed and added to your monthly water bill. In addition, water service to the affected site will be disconnected until the required testing documentation has been received by the Water Department.

Your cooperation in this matter is greatly appreciated. Please contact Randy Roberts, Cross Connection Control Coordinator, if you have further questions at Office (615) 459-9752 or Mobile (615) 517-2827.

Sincerely,

Randy Roberts
Cross-Connection Coordinator
Smyrna Utilities