ARLINGTON COUNTY, VIRGINIA
OFFICE OF THE PURCHASING AGENT
2100 CLARENDON BOULEVARD, SUITE 500
ARLINGTON, VIRGINIA 22201

CONTRACT AWARD COVERPAGE

TO:	FERGUSON ENTERPRISES, LLC DBA FERGUSON WATERWORKS 751 LAKEFRONT COMMONS NEWPORT NEWS, VA 23606	DATE ISSUED: CONTRACT NO: CONTRACT TITLE:	DECEMBER 29, 2023 24-DES-R-451 UTILITIES MATERIALS

THIS IS A NOTICE OF AWARD OF CONTRACT AND NOT AN ORDER. NO WORK IS AUTHORIZED UNTIL THE VENDOR RECEIVES A VALID COUNTY PURCHASE ORDER ENCUMBERING CONTRACT FUNDS.

The contract documents consist of the terms and conditions of Agreement No. 24-DES-R-451 including any attachments or amendments thereto.

EFFECTIVE DATE: DECEMBER 29, 2023
EXPIRES: OCTOBER 5, 2024
RENEWALS: FOUR ADDITIONAL ONE (1) YEAR RENEWALS REMAIN
COMMODITY CODE(S): 95895
LIVING WAGE: N

ATTACHMENTS:
AGREEMENT NO. 24-DES-R-451
EXHIBIT A: STAFFORD COUNTY CONTRACT NO. 22-025-5030-SB
NO COUNTY EMPLOYEE SHALL RECEIVE ANY SHARE OR BENEFIT OF THIS CONTRACT NOT AVAILABLE TO THE GENERAL PUBLIC.

VENDOR CONTACT:	PAT BURKE	VENDOR TEL. NO.:	(703) 228-7612
EMAIL ADDRESS:	PAT.BURKE@FERGUSON.COM		
COUNTY CONTACT:	JON LAWLER	COUNTY TEL. NO.:	(703) 228-3294
COUNTY CONTACT EMAIL:	JLAWLER@ARLINGTONVA.US		

PURCHASING DIVISION AUTHORIZATION

BRIANA HENLEY **TITLE: PROCUREMENT OFFICER** **DATE: DECEMBER 29, 2023**

ARLINGTON COUNTY, VIRGINIA
OFFICE OF THE PURCHASING AGENT
2100 CLARENDON BOULEVARD, SUITE 500
ARLINGTON, VA 22201

RIDER AGREEMENT NO. 24-DES-R-451

THIS AGREEMENT (hereinafter "Agreement") is made, on the date of its execution by the County, between Ferguson Enterprises, LLC dba Ferguson Waterworks("Contractor"), a Virginia corporation with a place of business at 751 Lakefront Commons, Newport News, VA 23606 authorized to transact business in the Commonwealth of Virginia, and the County Board of Arlington County, Virginia ("County"). The County and the Contractor, for the consideration specified herein or specified in a County Purchase Order referencing this Agreement, agree as follows:

1. CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Exhibit A Stafford County Contract No. 22-025-5030-SB together with any exhibits and amendments issued or applicable thereto (collectively, "Contract Documents" or "Contract"). This Agreement rides a contract awarded to the Contractor by _Stafford County and extended by the Contractor to the County on the same terms and conditions. Where the terms of this Agreement vary from the terms and conditions of the other Contract Documents, the terms and conditions of this Agreement shall prevail.

The Contract Documents set forth the entire agreement between the County and the Contractor. The County and the Contractor agree that no representative or agent of either of them has made any representation or promise with respect to the parties' agreement which is not contained in the Contract Documents.

2. CONTRACT TERM

The Contractor's provision of goods and services for the County ("Work") shall commence upon the execution of the Agreement by the County", and shall be completed no later than October 5, 2024 ("Contract Term"), subject to any modifications as provided for in the Contract Documents regarding the Contract Term. No aspect of the Work shall be deemed complete until it is accepted by the County's Project Officer.

Upon satisfactory performance by the Contractor, if the Stafford County renews their agreement identified in Exhibit A, the County may elect to renew this Agreement under the same contract terms for four (4) one-year renewal periods from October 6, 2024 to October 5, 2028 ("Subsequent Contract Term"). However, if the Stafford County does NOT renew their agreement identified in Exhibit A, this Agreement shall automatically expire on the contract expiration date.

3. PAYMENT

Payment will be made by the County to the Contractor within forty-five (45) days after receipt by the County Project Officer of an invoice detailing the Work provided by the Contractor and accepted by the County. All payments will be made from the County to the Contractor via ACH. The Project Officer will either approve the invoice or require corrections. The number of the County Purchase Order pursuant to which authority goods or services have been performed or delivered shall appear on all invoices.

The Contractor also must submit to the County's Project Officer its W-9 Form, which will include its Federal Employer Identification Number ("FEIN") or Social Security Number ("SSN"), whichever is applicable, before the County can process payment to the Contractor under the Contract.

4. SCOPE OF WORK

The Contractor agrees to perform the goods and/or services described in the Contract Documents (hereinafter "the Work"). The primary purpose of the Work is to furnish utilities materials.

The Contract Documents set forth the minimum Work estimated by the County and the Contractor to be necessary to complete the Work. It shall be the Contractor's responsibility, at the Contractor's sole cost, to provide the specific Work set forth in the Contract Documents sufficient to fulfill the purposes of the Work. Nothing in the Contract Documents shall be construed to limit the Contractor's responsibility to manage the details and execution of the Work.

5. PROJECT OFFICER

The performance of the Contractor is subject to the review and approval of the County Project Officer ("Project Officer") who shall be appointed by the Director of the Arlington County department or agency which seeks to obtain the Work pursuant to this Contract. However, it shall be the responsibility of the Contractor to manage the details of the execution and performance of its Work pursuant to the Contract Documents.

6. COUNTY PURCHASE ORDER REQUIREMENT

County purchases are authorized only if a County Purchase Order is issued in advance of the transaction. A Purchase Order must indicate that the ordering agency has sufficient funds available to pay for the purchase. Such a Purchase Order is to be provided to the Contractor by the ordering agency. The County will not be liable for payment for any purchases made by its employees without appropriate purchase authorization issued by the County Purchasing Agent. If the Contractor provides goods or services without a signed County Purchase Order, it does so at its own risk and expense.

7. NON-APPROPRIATION

All funds for payments by the County to the Contractor pursuant to this Contract are subject to the availability of an annual appropriation for this purpose by the County Board of Arlington County, Virginia. In the event of non-appropriation of funds by the County Board of Arlington County, Virginia for the goods or services provided under this Contract or substitutes for such goods or services which are as advanced or more advanced in their technology, the County will terminate the Contract, without termination charge or other liability to the County, on the last day of the then current fiscal year or when the appropriation made for the then current year for the services covered by this Contract is spent, whichever event occurs first. If funds are not appropriated at any time for the continuation of this Contract, cancellation will be accepted by the Contractor on thirty (30) days prior written notice, but failure to give such notice shall be of no effect and the County shall not be obligated under this Contract beyond the date of termination specified in the County's written notice.

8. APPLICABLE LAW, FORUM, VENUE AND JURISDICTION

This Contract and the work performed hereunder shall be governed in all respects by the laws of the Commonwealth of Virginia, and the jurisdiction, forum, and venue for any litigation with respect thereto shall be in the Circuit Court for Arlington County, Virginia, and in no other court. In performing its Work pursuant to this Contract, the Contractor shall comply with applicable federal, state, and local laws, ordinances and regulations.

9. NOTICES

Unless otherwise provided herein, all notices and other communications required by this Contract shall be deemed to have been given when made in writing and either (a) delivered in person, (b) delivered by an agent, such as an overnight or similar delivery service, or (c) deposited in the United States mail, postage prepaid, certified or registered, addressed as follows:

TO THE CONTRACTOR:
Pat Burke, Municipal Sales Manager
Ferguson Enterprises, LLC
751 Lakefront Commons
Newport News, VA 23606
Phone: (703) 576-4395
Email: pat.burke@ferguson.com

TO THE COUNTY:
Jon Lawler, Project Officer
Arlington County, Virginia
4200 S 28th St 1FL
Arlington VA 22201
Phone: (703) 228-7612
Email: jlawler@arlingtonva.us
AND

Dr. Sharon T. Lewis, LL.M, MPS, VCO, CPPB
Purchasing Agent
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 500
Arlington, Virginia 22201
Phone: (703) 228-3294
Email: slewis1@arlingtonva.us

TO COUNTY MANAGER'S OFFICE (FOR PROJECT CLAIMS):

Mark Schwartz, County Manager
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 318
Arlington, Virginia 22201

10. ARLINGTON COUNTY BUSINESS LICENSES

The Contractor must comply with the provisions of Chapter 11 ("Licenses") of the Arlington County Code, if applicable. For information on the provisions of that Chapter and its applicability to this Contract, the

Contractor must contact the Arlington County Business License Division, Office of the Commissioner of the Revenue, 2100 Clarendon Blvd., Suite 200, Arlington, Virginia, 22201, telephone number (703) 228-3060, or e-mail business@arlingtonva.us.

11. COUNTERPARTS

This Agreement may be executed in one or more counterparts and all of such counterparts shall together constitute one and the same instrument. Original signatures transmitted and received via facsimile or other electronic transmission, (e.g., PDF or similar format) are true and valid signatures for all purposes hereunder and shall be effective as delivery of a manually executed original counterpart.

WITNESS these signatures:

THE COUNTY BOARD OF ARLINGTON COUNTY, VIRGINIA	FERGUSON ENTERPRISES, LLC DBA FERGUSON WATERWORKS
AUTHORIZED SIGNATURE: DocuSigned by: Briana Henley A6FA14193D48441...	AUTHORIZED SIGNATURE: DocuSigned by: PAT BURKE 0975A1D623E349D...
NAME: Briana Henley	NAME: Patrick Burke
TITLE: Procurement Officer	TITLE: Municipal Sales Manager
DATE: 12/29/2023	DATE: 12/18/2023

COUNTY OF STAFFORD
P.O. Box 339, 1300 Courthouse Road
Stafford, VA 22555-0339
Phone (540)658-8610
Procurement@StaffordCountyVa.gov

FINANCE AND BUDGET DEPARTMENT PROCUREMENT DIVISION

NOTICE OF AWARD

DATE OF AWARD:	October 6, 2022
CONTRACT TITLE:	Utilities Materials
CONTRACT NUMBER:	22-025-5030-SB
PERIOD OF PERFORMANCE:	October 6. 2022 through October 5. 2027 with one optional five-year renewal period
PRICING:	Reference Contractor's Pricing to IFB Attached.
CONTRACT DOCUMENTS:	The Contract Documents consist of the terms, conditions, and specifications of the following, incorporated into this Notice of Award by reference:

- Exhibit A: Invitation for Bid (IFB) No. 22-025-5030-SB
- Exhibit B: Contractor's Bid to IFB No. 22-025-5030-SB

This Notice of Award is notice to the Contractor of an award of a Contract, and not an order. No work is authorized until the Contractor receives a valid County Purchase Order.

CONTRACTOR:

Ferguson Enterprises, LLC dba.
Ferguson Waterworks
311 Central Road
Fredericksburg, VA 22401

Michael Morris
Michael A. Morris
Deputy County Administrator

10/7/22
Date

INVITATION FOR BID

Issue Date: Monday, May 9, 2022

IFB No. 22-025-5030-SB

UTILITIES MATERIALS

Bid Due Date/Time:
Tuesday, June 7, 2022
2:00 P.M. Eastern Standard Time (EST)

Bid Opening Date/Time:
Tuesday, June 7, 2022
2:15 P.M. Eastern Standard Time (EST)

Questions Due Date/Time:
Questions from Bidders must be received by **Friday, May 27, 2022 at 2:00 P.M. Eastern Standard Time (EST).** Questions must be emailed to the Contracts Officer listed below. The County is not responsible for verbal clarification of information provided by parties other than staff of the Procurement Division.

Electronic bid submission via eVA.virginia.gov ONLY!

Senior Contracts Officer
Andrew Sukeforth
(540) 658-8614
Email: procurement@StaffordCountyVA.gov

TERMS & CONDITIONS	In compliance with this IFB and all conditions imposed in this IFB, the undersigned firm hereby offers and agrees to furnish all goods and services required by this IFB at the prices indicated in the pricing schedule, and the undersigned firm hereby certifies that all information provided below and in any schedule attached hereto is true, correct, and complete.

BIDDER INFORMATION

Virginia Contractor License No. ☐Required _____
☐Not Required

Name of Firm: _____

Address of Firm: _____

By (Signature in Ink) _____ Date: _____

Name (print) _____ Title (print) _____

Phone: _____ Email: _____

In accordance with Virginia Code § 2.2-4343.1, as amended, Stafford County does not discriminate against faith-based organizations. The County does not discriminate against a bidder because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law.

TOTAL BID PRICE (This shall be Cell I74 on Attachment A – Pricing Sheet):

_____**Dollars**
(*written form)*

(**$**_____)

If the Total Bid Price amount contains contradictory terms, typewritten terms prevail over printed terms, handwritten terms prevail over both, and words prevail over numbers.

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NOTE TO PROSPECTIVE BIDDERS:

- This solicitation is subject to the provisions of the Stafford County Information for Bid (IFB) and any attachments, exhibits, revisions or amendments thereto, which are hereby incorporated into this bid in their entirety. If not attached, a copy of these terms and conditions is available for review at the Procurement Office. Special Terms and Conditions and Specifications attached shall also be part of your bid. The Bid Package and the Construction Plans (as applicable) are available at no charge on the Commonwealth of Virginia's electronic procurement system, eVA, www.eva.virginia.gov and the County Website. Please be observant of all Bid instructions and specifications. Should any questions arise concerning this Bid, contact the Procurement Office at procurement@StaffordCountyVA.gov.

- Please note the meaning of the following terms as used in this Invitation for Bid (IFB): The term "bidder" as referenced in this solicitation refers to the individual or firm preparing and submitting a bid in response to this Invitation for Bid. The term "Contractor" refers to an individual or firm that has entered into an agreement to provide goods or services to Stafford County, Virginia, its officers, employees and agents (the "County"). In addition, it also refers to a firm who, when awarded the contract, will be responsible for goods and services required, as a result of this solicitation.

1. PURPOSE

The Stafford County Department of Utilities (Department) is responsible for the continued reliability of the water production and distribution along with the collection systems and treatment of wastewater. There is a continuous need for parts for the construction and maintenance of water and wastewater infrastructure (Materials) within Stafford County. Materials are defined as all parts, consumable good/and or other items are not installed by a contractor. The purpose of this Invitation for Bid (IFB) is to solicit bids from qualified bidders to establish a term contract to furnish Materials on an as-needed basis.

The County may select up to six (6) Vendors to furnished Materials. All selected Vendors shall provide Materials that follow all current and future revisions to applicable laws, standards, specifications and revisions as set per:

- Federal Guidelines
  - United States Environmental Protection Agency – Drinking Water Regulations
  - United States Environmental Protection Agency – Sanitary Sewer
  - United States Environmental Protection Agency – Stormwater Rules and Notices
  - United States Federal Highway Administration - Environmental
  - United States Federal Highway Administration- Pavement Design
  - United States Federal Highway Administration - Stormwater
  - United States Federal Highway Administration – Urban Design Drainage Manual
  - United States Bureau of Labor Statistics Consumer Price Index for All Urban Consumers CPI-U

- Commonwealth of Virginia
  - Department of Environmental Quality – Sanitary Sewer
  - Department of Environmental Quality - Stormwater
  - Virginia Department of Health – Water
  - Virginia Department of Transportation – Road and Bridge Standards
  - Virginia Department of Environmental Quality Erosion and Sediment Control Handbook
  - Virginia Department of Health Drinking Water Rules and Regulations

- Standards and Certifications
  - American Water Works (AWWA)
  - Virginia Water Environment Association (VWEA)
  - American Public Works Association (APWA)
  - American National Standards Institute (ANSI)
  - ASTM International (ASTM)
  - UL, LLC (UL)
  - American Society of Sanitary Engineers (ASSE)
  - Association for Materials Protection and Performance (AMPP)
  - International Organization for Standardization (ISO)

- Association and Manufacturer Guidelines
  - American Concrete Pipe Association
  - Ductile Iron Water Main Pipe Research Association

- Plastic Pipe and Fittings Association
- Muller - Fire Hydrants
- Kennedy Valve - Fire Hydrants

2. SCOPE OF WORK

The Department is looking for the flexibility for the purchase of Materials from up to six (6) qualified Vendors. This contract is to allow the Department to obtain Materials at a price and time frame that meets the needs of the Department. Attachment C provides a list of parts and materials that the Department currently uses for water and sewer infrastructure projects, however Vendors may propose equal Materials to be approved by the Department. There is no minimum guarantee of purchase of Materials from a single Vendor.

A. The Pricing Sheet shall be completed as follows:

I. Bidders shall complete Attachment A by providing pricing for the pre-selected items on the Pricing Sheet.

II. The Bidder shall also provide an overall average percentage discount on the bottom of Attachment A. This percentage discount is across the entire product line that is offered by the Vendor. It is understood that individual materials may have varied discounts depending on the product.

III. Bidder shall provide a price for all items listed. If the Bidder fails to include a price on a line item, the bid may be deemed nonresponsive.

B. The Bidder shall also submit in an electronic SEARCHABLE PDF CATALOG (Catalog) as part of the submission. The Catalog shall be of the latest pricing and shall include at minimum:

I. Part Number
II. Manufacturer
III. Part Description
IV. Part Specifications
V. Unit Cost
VI. Discount of Material being offered (for items not listed in Attachment A)

C. The Contract term shall be effective from the Date of Award (anticipated July 1, 2022) through June 30, 2027, and shall have the option to be renewed for an additional five (5) year period (until June 31, 2032).

3. AWARD

3a. LOWEST RESPONSIVE AND RESPONSIBLE BIDDER.

a. The lowest bidder shall be determined by the lowest **Total Bid Price set forth on page 2 of the IFB**.

b. Award of the bid may be awarded to up to the lowest six (6) bidders.

c. A responsive bidder shall mean a bidder who has submitted a bid which conforms, in all material respects, to the bidding documents.

d. Responsible bidder shall mean a bidder who has the capability, in all respects, to perform fully the contract requirements and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the following criteria will be considered:

i. The ability, capacity and skill of the bidder to perform the contract or provide the service required;
ii. Whether the bidder can perform the contract or provide the service promptly, or within the time specified, without delay or interference;
iii. The character, integrity, reputation, judgment, experience and efficiency of the bidder;
iv. The quality of performance of previous contracts or services. For example, the following information will be considered:
    1. The administrative and consultant cost overruns incurred by County on previous contracts with bidder,
    2. The bidder's compliance record with contract general conditions on other projects,
    3. The submittal by the bidder of excessive and/or unsubstantiated extra cost proposals and claims on other projects,
    4. The bidder's record for completion of the work within the contract time or within contract milestones and bidder's compliance with scheduling and coordination requirements on other projects,
    5. The bidder's demonstrated cooperation with the County, Engineer and other contractors on previous contracts,
    6. Whether the work performed and materials furnished on previous contracts was in accordance with the contract documents, and
    7. Whether the work performed on other contracts was of high quality;
v. The previous and existing compliance by the bidder with laws and ordinances relating to contracts or services;
vi. The sufficiency of the financial resources and ability of the bidder to perform the contract or provide the service;
vii. The quality, availability and adaptability of the goods or services to the particular use required;
viii. The ability of the bidder to provide future maintenance and service for the warranty period;
ix. The number and scope of the conditions attached to the bid;
x. Whether the bidder is in arrears to Stafford County on debt or contract or is a defaulter on surety to Stafford County or whether the bidder's Stafford County taxes or assessments are delinquent; and
xi. Such other information as may be secured by the County, having a bearing on the decision to award the contract, to include, but not limited to:

1. The ability, experience and commitment of the bidder to properly and reasonably plan, schedule, coordinate and execute the work,
2. Whether the bidder has ever been debarred from bidding or found ineligible for bidding on any other projects.

e. The purpose of the above is to enable the County, in its opinion, to select the bid which is in the best interests of the County. The ability of the low bidder to provide the required bonds will not of itself demonstrate responsibility of the bidder.

f. The County reserves the right to require from the bidder: (1) submissions of additional references, to include a listing of previous and current projects and (2) financial statements indicating current financial status prepared in accordance with generally accepted accounting principles, by a CPA licensed to do business in Virginia.

g. The County reserves the right to defer award of this Contract for a period of ninety (90) days after the due date of Bids. During this period of time, the Bidder shall guarantee the prices quoted in his bid.

4. OPTIONAL PRE-BID CONFERENCE

An optional pre-bid conference will be held on May 23, 2022 at 1:00 P.M. via WebEx. The purpose of this conference is to allow potential bidders an opportunity to present questions and obtain clarification relative to any facet of this solicitation.

Any changes resulting from this conference will be issued in a written addendum to the solicitation.

WebEx Meeting Information:

Utilities Materials Pre-Bid Conference Meeting
Hosted by Andrew Sukeforth

https://scva-gov.webex.com/scva-gov/j.php?MTID=m121061c5157613c9329ae0c1a6f7dca0
Monday, May 23, 2022 1:00 pm | 2 hours | (UTC-04:00) Eastern Time (US & Canada)
Meeting number: 2349 937 7760
Password: xFnrDbHV285 (93673248 from video systems)

Join by video system
Dial 23499377760@scva-gov.webex.com
You can also dial 173.243.2.68 and enter your meeting number.

Join by phone
+1-415-655-0001 US Toll

Access code: 234 993 77760

5. BID CHECKLIST

5a. Bidders are required to include the following with their bid. Failure to provide these items **will** result in rejection of the bid.

A. IFB Coversheet (Page 2)

B. Total Bid Price, and any allowances (if applicable)
C. Pricing Sheet
D. Electronic Searchable PDF Catalog

5b. Bidders are requested to include the following with their bid. Failure to provide these items **may** result in rejection of the bid.

A. Reference List
B. Trade Secret / Proprietary Information Identification Form (when applicable)
C. Certification of Safety Violations Form
D. Small and Minority Business Data Form
E. State Corporation Commission Form
F. Complete W-9 Form
G. Any IFB Addenda

6. BIDDER'S INSTRUCTIONS

6a. BID FORMS. Unless otherwise specified in the solicitation, all bids must be (i) submitted on the forms provided by the County, including the bid Cover Sheet and Pricing Schedule(s); and (ii) properly signed in ink in the identified spaces.

6b. ACCEPTANCE OF BIDS/BINDING 90 DAYS. Unless otherwise specified, all formal bids submitted shall be binding for ninety (90) calendar days following bid opening date, unless extended by mutual consent of all parties.

6c. BID OPENING. All bids received in response to an Invitation for Bid (IFB) will be opened at the date and time specified, read publicly via WebEx, and made available for inspection. The Procurement Administrator's representative assigned to open the bids will decide when the specified time for bid opening has arrived.

WebEx Meeting Information:

Utilities Materials Bid Opening
Hosted by Andrew Sukeforth

https://scva-gov.webex.com/scva-gov/j.php?MTID=m1f0dcf793689af33c284d057b3d5ded0
Tuesday, Jun 7, 2022 2:15 pm | 1 hour | (UTC-04:00) Eastern Time (US & Canada)
Meeting number: 2346 656 0487
Password: Rfdfmjk27P3 (73336552 from video systems)

Join by video system
Dial 23466560487@scva-gov.webex.com
You can also dial 173.243.2.68 and enter your meeting number.

Join by phone
+1-415-655-0001 US Toll

Access code: 234 665 60487

Tabulations of bids received are posted on the County's website at: https://staffordcountyva.gov/Bids.aspx.

6d. MODIFICATION OR WITHDRAWAL OF BID.

A. **Clerical Mistake.** A bidder may withdraw his bid from consideration if the price bid was substantially lower than the other bids due solely to a mistake therein, provided the bid was submitted in good faith and the mistake was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a bid, which can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn.

B. **Clerical and Judgement Mistake.** If a bid contains both clerical and judgment mistakes, a bidder may withdraw his bid from consideration if the price bid would have been substantially lower than the other bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a bid that shall be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn.

C. **Notice.** The bidder shall give notice in writing of his claim of right to withdraw his bid within two business days after the conclusion of the bid opening procedure and shall submit original work papers with such notice.

D. No bid shall be withdrawn under this section when the result would be the awarding of the contract on another bid of the same bidder or of another bidder in which the ownership of the withdrawing bidder is more than five percent (5%).

E. No bidder who is permitted to withdraw a bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.

6e. LATE BIDS.

A. Bids received after the date and time specified for receipt in the solicitation will not be considered.

B. If an emergency, unanticipated event, or closing of County offices interrupts or suspends normal County business operations so that bids cannot be received at the County office designated for receipt of bids by the exact time specified in the solicitation, then bids will be due at the same time of day specified in the solicitation on the first work day that normal County business operations resume. The official time used for receipt of bids is the time and date stamp clock located in the County Procurement Office. No other clocks, calendars or timepieces are recognized. All bidders must ensure all bids are received prior to the scheduled due date/time.

6f. CONDITIONAL BIDS. Conditional bids may be rejected in whole or in part.

6g. BIDS FOR ALL OR PART. The Procurement Director reserves the right to make award on all items in the aggregate or on any of the items on an individual basis, whichever is in the best interest of the County. A bidder may restrict its bid to consideration in the group aggregate by so stating, but must name a single unit price on each item bid. Any bid in which the bidder names a total price for all the articles without quoting a unit price for each and every separate item may not be considered for award.

6h. ERRORS IN BIDS. When an error is made in extending total prices, the unit bid price will govern. Erasures in bids must be initialed by the bidder. Bidders are cautioned to recheck their bids for possible error. Errors discovered after public opening cannot be corrected and the bidder will be required to perform if its bid is accepted.

6i. OMISSIONS & DISCREPANCIES. Any items or parts of any equipment listed in this solicitation that clearly necessary for the operation and completion of such equipment, but are: (i) not fully described by the County; or (ii) are omitted by the County from such specification, shall be considered a part of such equipment even if not directly specified or called for in the specifications. If a bidder finds discrepancies or ambiguities in, or omissions from, the solicitation, including the drawings and/or specifications, it shall notify the Contracts Officer listed on the first page of this IFB by March 6, 2022 at 2:00 p.m.

6j. NEGOTIATION WITH RESPONSIBLE AND RESPONSIVE BIDDER. If the bid of the lowest responsive and responsible bidder exceeds the available funds for such project, the Procurement Administrator or designee may negotiate with the apparent low bidder in order to obtain a contract price within available funding limits.

Such negotiation may include, but is not necessarily limited to:

A. Reduction of scope, goods, services, insurance, or construction procured.
B. Adjustment of the bid price.
C. Substitution of materials.
D. Changes in the period for project completion.
E. The conditions and procedures for such negotiations shall be as set out in the Procurement Policies and Regulations Stafford County, Virginia, as last revised ("Stafford County Procurement Policy").

Notwithstanding the foregoing, the Procurement Administrator has the right to cancel any solicitation, to reject any or all bids, even after negotiations with the low bidder and to waive any informality in bids.

6k. DEBARMENT. By submitting a bid, the bidder is certifying that he/she is not currently debarred by the State.

6l. TAX EXEMPTION. The County is exempt from the payment of any federal excise or any Virginia sales tax. Stafford County's Federal Excise Tax Exemption Number is **0001910140**.

6m. PROHIBITION AGAINST UNIFORM PRICING. The Procurement Administrator encourages open and competitive bidding by all possible means and endeavors to obtain the maximum degree of open competition on all purchase transactions using the methods of procurement authorized by Stafford County Procurement Policy and VPPA. Each bidder, by virtue of submitting a bid, guarantees that it has not been a party with other bidders to an agreement to bid a fixed or uniform price. Violation of this implied

guarantee shall render void the bids of participating bidders. Any disclosure to or acquisition by a competitive bidder, in advance of the opening of the bids, of the terms or conditions of the bid submitted by another competitor may render the entire proceedings void and may require re-advertising for bids.

6n. COOPERATIVE PURCHASING. Bidders are advised that the County will extend all resultant contracts, with the authorization of the bidder, to the Metropolitan Washington Council of Governments jurisdictions and other jurisdictions and political subdivisions of the Commonwealth of Virginia to permit their ordering of supplies and/or services at the prices and terms of the resulting contract. If any other jurisdiction decides to use the final contract, the contractor must deal directly with that jurisdiction or political subdivision concerning the placement of orders, issuance of the purchase order, contractual disputes, invoicing and payment. Stafford County acts only as the "Contracting Agent" for these jurisdictions and political subdivisions. Failure to extend a contract to any jurisdiction will have no effect on consideration or your bid. It is the responsibility of the awarded contractor to notify the jurisdictions and political subdivisions of the availability of the contract. Stafford County shall not be held liable for any costs or damage incurred by another jurisdiction as a result of any award extended to that jurisdiction or political subdivision by the awardee.

6o. OFFICIALS NOT TO BENEFIT. Each bidder shall certify, upon signing a bid, that to the best of their knowledge no Stafford County official or employee having official procurement responsibility as provided in Article 6 of the Stafford County Procurement Policy, or member of their immediate family, has received or will receive any financial benefit of more than nominal or minimal value relating to the award of this contract. If such a benefit has been received or will be received, this fact shall be disclosed with the bid or as soon thereafter as it appears that such a benefit will be received. Failure to disclose the information prescribed above may result in suspension or debarment, or rescission of the contract made, or could affect payment pursuant to the terms of the contract.

6p. AUTHORIZATION TO CONDUCT BUSINESS IN THE COMMONWEALTH. A bidder organized or authorized to transact business in the Commonwealth pursuant to Title 13.1 or Title 50 of the Code of Virginia shall include in its bid the identification number issued to it by the State Corporation Commission. Any bidder that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law shall include in its bid a statement describing why the bidder is not required to be so authorized. Any bidder described herein that fails to provide the required information shall not receive an award unless a waiver of this requirement and the administrative policies and procedures established to implement this Article is granted by the County Administrator (https://cisiweb.scc.virginia.gov/z_container.aspx).

6q. W-9 FORM. Each bidder will submit a completed W-9 form with their bid. In the event of a contract award, this information is required in order to issue purchase orders and payments the bidder. A copy of this form can be downloaded from http://www.irs.gov/pub/irs-pdf/fw9.pdf.

7. METHOD OF PAYMENT

The Contractor will be paid on the basis of invoices submitted. Payments will be made thirty (30) days after receipt of a proper invoice or receipt of goods or services, whichever is later.

The Department will have the option of paying the Contractor in less than thirty (30) days if a discount is offered for expedient payment.

Invoices shall be submitted to the following address:

County of Stafford, Virginia
Utilities Department
Attn: Group Ordering Materials
Attn: Inventory Control Manager
71 Coal Landing Road
Stafford, VA 22555

Unless otherwise stated in the Contract or Purchase Order, all order shall be directed to the Field Operations Center.

8. GENERAL CONDITIONS

8a. BRAND NAME OR EQUAL ITEMS. Unless otherwise provided in the IFB, the name of a certain brand, make or manufacturer does not restrict bidders to the specific brand, make or manufacturer named; it conveys the general style, type, character, and quality of the article desired. Any article that the County in its sole discretion determines to be the equivalent of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The bidder is responsible for clearly and specifically identifying the product being offered and providing sufficient descriptive literature, catalog cuts and technical detail to enable the County to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make, or manufacturer specified. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the bidder clearly indicates in its bid that the product is an equivalent product, such bid will be considered to offer the brand name product referenced in the solicitation.

8b. SPECIFICATIONS. When a solicitation contains a specification that states no substitutes, no deviation therefrom will be permitted and the bidder will be required to furnish articles in conformity with that specification. The bidder must abide by and comply with the true intent of the specifications and not take advantage of any unintentional error or omission, but shall fully complete every part as the true intent and meaning of the specifications and drawings. Whenever the mention is made of any articles, material, or workmanship to be in accordance with laws, ordinances, building codes, or similar expressions, the requirements of these laws, ordinances, etc., shall be construed as to the minimum requirements of these specifications.

8c. SUBCONTRACTS. No portion of the work shall be subcontracted without prior written consent of the County. In the event that the Contractor desires to subcontract some part of the work specified herein, the Contractor shall furnish the County the names, qualifications and experience of their proposed subcontractors. The contractor shall, however, remain fully liable and responsible for the work to be done by its subcontractor(s) and shall assure compliance with all requirements of the contract.

8d. VIRGINIA FREEDOM OF INFORMATION ACT. All proceedings, records, contracts and other public records relating to procurement transactions shall be open to the inspection of any citizen, or any interested person, firm or corporation, in

accordance with the Virginia Freedom of Information Act, Virginia Code § 2.2-3700 et seq., except as provided below:

A. Cost estimates relating to a proposed procurement transaction prepared by or for a public body shall not be open to public inspection.
B. Any competitive sealed bidding bidder, upon request, shall be afforded the opportunity to inspect bid records within a reasonable time after the opening of all bids but prior to award, except in the event that the County decides not to accept any of the bids and to reopen the contract. Otherwise, bid records shall be open to public inspection only after award of the contract.

C. The County reserves the right to impose restrictions over the inspection of procurement transaction records to ensure the security and integrity of the records.

D. Trade secrets or proprietary information submitted by a bidder in connection with a procurement transaction shall not be subject to the Virginia Freedom of Information Act (§ 2.2-3700 et seq.) if the bidder has (i) invoked the protections of this section prior to or upon submission of the data or other materials, (ii) identified the data or other materials to be protected, and (iii) stated the reasons why protection is necessary. When applicable, bidder shall submit the Trade Secret / Proprietary Information Identification Form with his/her bid. A bidder shall not designate as trade secrets or proprietary information (a) an entire bid; (b) any portion of a bid that does not contain trade secrets or proprietary information; or (c) line item prices or total bid prices.

8e. **NOTICE OF ACCEPTANCE/CONTRACT DOCUMENTS**: A written award mailed, emailed, or otherwise furnished to the successful bidder within the time for acceptance specified in the solicitation shall result in a binding contract. The following documents, which are included in the solicitation, are incorporated by reference in and made part of the resulting contract: a. Instructions for Bidders and Attachments; b. any Special Provisions and Specifications; c. Pricing Schedule; e. Any Addenda/Amendments.

8f. **TIE-BIDS**: If all bids are for the same total amount or unit price (including authorized discounts and delivery times), and if the public interest will not permit the delay of re-advertisement for bids, the Director of Procurement shall give preference to goods produced in Virginia, or goods and services provided by the resident Virginia tie bidder; otherwise contract award shall be decided by lot. However, if the contract is for goods, then preference shall be given to the bidder whose goods contain the greatest amount of recycled content. The decision of the County to make award to one or more such tie bidders shall be final.

8g. **DEFINITE BID QUANTITIES**: Intentionally Omitted

8h. **REQUIREMENT BID QUANTITIES**: Intentionally Omitted

8i. **SMALL, WOMEN-OWNED, AND MINORITY-OWNED BUSINESS USE**. The County encourages increasing opportunity for use of small or minority businesses in all aspects of procurement to the maximum extent feasible. Where it is practicable for any portion of the awarded contract to be subcontracted to other suppliers, the contractor is encouraged to offer such subcontracting opportunities to small, women and minority businesses.

8j. **DELIVERY FOB DESTINATION**. All goods shall be delivered FOB Destination to the County Using Department, at the time and place specified in the contract documents. Unless otherwise specified in the solicitation each case, container, package, etc., delivered under the contract must be plainly marked, stating the Contractor's name, purchase order number, and delivery address as indicated in the order. No deliveries will be accepted on Saturdays, Sundays and holidays, unless previous arrangements have been made.

8k. **INSPECTION-ACCEPTANCE**: Acceptance shall occur only after receipt and inspection provided such inspection, as appropriate, is accomplished within a reasonable time. The County reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

8l. **GUARANTEES & WARRANTIES**. All guarantees and warranties required shall be furnished by the bidder and shall be delivered to the Procurement Administrator before contract execution. Unless otherwise stated, manufacturer's standard warranty applies.

8m. **INSURANCE**. In addition to any other forms of insurance or bonds required in the Specifications, the Contractor shall provide and maintain the following insurance:

A. Workers' Compensation and Employer's Liability: Workers' Compensation insurance in accordance with statutory requirements, and Employer's Liability insurance in limits of not less than $500,000 (each employee) or a maximum limit of $1,000,000, to protect the Contractor from any liability or damages for any injuries (including death and disability) to any and all of its employees, including any and all liability or damage which may arise by virtue of any statute or law in force within the Commonwealth of Virginia.

B. Automobile Liability: A minimum of $2,000,000 combined single limit for each occurrence for property damage liability and bodily injury liability including death in Automobile Liability coverage. The policy shall cover all persons involved, at any time, and arising out of the ownership, maintenance, or use of owned, non-owned, borrowed, leased, rented, or hired automobiles. In addition, all mobile equipment used by the Contractor in connection with the contracted work, will be insured under a standard Automobile Liability policy. The Garage Keeper's Liability coverage shall also be maintained where appropriate.

C. Comprehensive General Liability: Comprehensive General Liability insurance at a minimum $1,000,000 per occurrence, written on an occurrence basis, including ongoing and completed operations; contractual liability; and $2,000,000 general aggregate. In addition, Comprehensive General Liability policy shall include a per project aggregate endorsement. Completed project aggregate endorsement shall continue in force for three (3) years following completion of the Contract.

D. Intentionally Omitted
   (i) Professional Liability: Intentionally Omitted
   (ii) Cyber Liability: Intentionally Omitted

E. Additional insurance provisions that apply to all Contracts include:
   (i) Additional Insured: The Stafford County Board of Supervisors, its officers, employees, agents, and volunteers shall be named as Additional Insured on the Automobile and Comprehensive General Liability coverage listed above,

and it shall be stated on the insurance certificate that this coverage "is primary and non-contributory to all other coverage the County may possess."

(ii) Liability Insurance "Claims Made" basis: If the liability insurance purchased by the contractor has been issued on a "claims made" basis, the contractor must comply with the following additional conditions. The limit of liability and the extensions to be included as described previously in these provisions, remain the same. The contractor must either:

1. Agree to provide certificates of insurance evidencing the above coverage for a period of two years after final payment for the contract. This certificate shall evidence a "retroactive date" no later than the beginning of the contractor's or sub contractor's work under the contract, or
2. Purchase the extended reporting period endorsement for the policy or policies in force during the term of the contract and evidence the purchase of this extended reporting period endorsement by means of a certificate of insurance or a copy of the endorsement itself.

(iii) Excess or Umbrella Liability Policy: Liability insurance may be arranged by Comprehensive General Liability and Automobile Liability policies for the full limits required, or by a combination of underlying liability policies for lesser limits with the remaining limits provided by an Excess or Umbrella Liability policy.

F. All contractors shall provide shall provide thirty days (30) notice of cancellation of any insurance policy. Each of the policies shall include a waiver of subrogation against Stafford County, its officers, employees, agents and volunteers.

G. The insurance specified herein shall be with an insurance company acceptable to the parties hereto and licensed to do business in the Commonwealth of Virginia. All insurance must be obtained before any work is commenced and kept in effect until its completion. If any of the work is sublet, similar insurance shall be obtained by or on behalf of the subcontractor to cover their operation.

H. Current insurance certificates documenting compliance with these coverage requirements shall be provided to the Procurement Administrator prior to the award of any contract.

9. BIDDER REMEDIES

9a. APPEAL OF DENIAL OF WITHDRAWAL OF BID. The County Administrator or a designee shall hear appeals of protests to the Chief Financial Officer's decision for refusal to allow withdrawal of bids. The County Administrator or a designee shall provide for a hearing, the opportunity to present pertinent information and shall issue a written decision containing findings or facts. The findings of fact shall be final and conclusive and shall not be set aside unless the same are fraudulent or arbitrary or capricious, or so grossly erroneous as to imply bad faith. No determination on an issue of law shall be final if appropriate legal action is instituted in a timely manner. A bidder may not institute legal proceedings until all administrative remedies as set forth herein or as required by the ordinances or resolutions of Stafford County have been exhausted.

9b. APPEAL OF DETERMINATION OF NONRESPONSIBILITY.

A. Any bidder who, despite being the apparent low bidder, is determined not to be a responsible bidder, shall be notified in writing by the Chief Financial Officer of

(i) the results of the evaluation, (ii) disclose the factual support for the determination, and (iii) allow the apparent low bidder an opportunity to inspect any documents that relate to the determination, if so requested by the bidder within five business days after receipt of the notice.

B. Within ten business days after receipt of the notice, the bidder may submit rebuttal information challenging the evaluation. The Chief Financial Officer shall issue its written determination of responsibility based on all information in the possession of the County, including any rebuttal information, within five business days of the date the County received the rebuttal information. At the same time, the Chief Financial Officer shall notify, with return receipt requested, the bidder in writing of its determination. The determination of nonresponsibility shall be final unless the bidder appeals the decision within ten days after receipt of the determination.

C. If, upon appeal to the County Administrator or his designee, it is determined that the decision of the Chief Financial Officer, was arbitrary or capricious, or otherwise in error and the award for the particular County contract in question has not been made, the sole relief available to the bidder shall be a finding that the bidder is a responsible bidder for the County contract in question.

D. Where the award has been made and performance has begun, the County may declare the contract void upon a finding that this action is in the best interest of the County. Where a contract is declared void, the performing contractor shall be compensated for the cost of performance up to the time of such declaration. In no event shall the performing contractor be entitled to lost profits.

9c. PROTEST OF AWARD OR DECISION TO AWARD.

A. Any bidder may protest the award or decision to award a contract by submitting a protest in writing to the Chief Financial Officer no later than ten (10) days after the award or the announcement of the decision to award, whichever occurs first; provided, however, that no protest shall lie for a claim that the selected bidder is not a responsible bidder. The written protest shall include the basis for the protest and the relief sought. The Chief Financial Officer shall issue a decision in writing within ten (10) days of the receipt of the protest stating the reasons for the action taken. This decision shall be final unless the bidder appeals within ten (10) days of receipt of the written decision.

B. If prior to award it is determined that the decision to award is arbitrary or capricious, then the sole relief shall be a finding to that effect. The Chief Financial Officer shall cancel the proposed award or revise it to comply with the law. If, after an award, it is determined that an award of a contract was arbitrary or capricious, then the sole relief shall be as hereinafter provided. Where the award has been made but performance has not begun, the performance of the contract may be declared void by the County. Where the award has been made and performance bas begun, the Chief Financial Officer may declare the contract void upon a finding that this action is in the best interest of the County. Where a contract is declared void, the performing contractor shall be compensated for the cost of performance at the rate specified in the contract up to the time of such declaration. In no event shall the performing contractor be entitled to lost profits.

C. Pending final determination of a protest or appeal, the validity of a contract awarded and accepted in good faith in accordance with this Paragraph shall not be affected by the fact that a protest or appeal has been filed.

D. An award need not be delayed for the period allowed a bidder to protest, but in the event of a timely protest, no further action to award the contract will be taken unless there is a written determination that proceeding without delay is necessary to protect the public interest or unless the bid or offer would expire.

10. CONTRACTUAL TERMS AND CONDITIONS

10a. PAYMENT. Payment shall be made after satisfactory performance that is in accordance with all provisions of the contract, and upon receipt of a properly completed invoice. The County reserves the right to withhold any or all payments or portions thereof for contractor's failure to perform in accordance with the provision of the contract or any subsequent modifications.

10b. PARTIAL PAYMENTS. Unless otherwise specified, partial payments will be made upon acceptance of materials or services so invoiced if in accordance with completion date.

10c. PAYMENT FOR EQUIPMENT, INSTALLATION, AND TESTING. When equipment requires installation (which includes erection, setting up or placing in position, service, or use) and testing, and the installation or testing is delayed, payment may be made based on 50% of the contract price when such equipment is delivered on the site. A further allowance of 25% may be made when the equipment is installed and ready for test. The balance shall be paid after the equipment is tested and found to be satisfactory. If the equipment must be tested, but installation is not required to be made by the contractor or if the equipment must be installed but testing is not required, payment may be made based on 75% at the time of delivery and the balance shall be paid after satisfactory test or installation is completed.

10d. PRICE INCREASES. Price increases may be negotiated only at the time of renewal in accordance with this section. The Contractor, upon written notification, shall notify the County of the desire to renew this Contract for an additional term. If the County elects to exercise the option to renew the contract for an additional five-year period, the contract price(s) for the renewal year shall be increased by no more than the All Urban Consumers (CPI-U) based on the Unadjusted Percent of Change between December to December of the prior year. If the CPI-U is less than 3%, then the contractor can claim an increase up to 3%. With any request for a price increase, Contractor shall provide justification to the County Contracts Officer including the methodology that was used to determine the increase, and other documentation used to determine the price increase.

10e. MOST FAVORED NATION. If the contractor makes a general price reduction for any material covered by the IFB to customers generally, an equivalent price reduction shall apply to this contract for the duration of the contract period (or until the price is further reduced). Such price reduction shall be effective at the same time and in the same manner as the reduction in the price to customers generally. For purpose of this provision, a "general price reduction" shall mean any horizontal reduction in the price of an article or service offered (i) to contractor's customers generally, or (ii) in the contractor's price schedule for the class of customers (i.e., wholesalers, jobbers, or

retailers), which was used as the basis for bidding on this solicitation. An occasional sale at a lower price, or sale of distressed merchandise at a lower price is not a "general price reduction" under this provision. The contractor shall submit its invoice at such reduced prices indicating on the invoice that the reduction is pursuant to the "Price Reduction" provision of the contract documents. The contractor will also within ten (10) days of any general price reduction notify the Procurement Administrator of such reduction by letter. Failure to do so may result in termination of the contract.

10f. PRICE RENEGOTIATION. The County reserves the right, at any time during the contract term or any extension of the term, to renegotiate with the contractor a reduction in the compensation paid to the contractor that is less than the compensation initially agreed to by the contractor and the County at the time of contract execution/issuance of the purchase order. The County may initiate such negotiations whenever the County determines that it is in the County's best fiscal interests to do so. Notwithstanding any other provision of this contract/purchase order to the contrary; the County may terminate the contract/purchase order immediately and without penalty if the County is unable to renegotiate the compensation with the contractor to an amount which the County determines to be appropriate.

10g. CONTRACT EXTENSION. The County has the right to extend any contract(s) awarded as a result of this IFB for up to one hundred eighty (180) days following any term on the contract.

10h. NON-APPROPRIATION OF FUNDS. The obligations of the County to pay compensation due to the contractor pursuant to the contract or any other payment obligations under any contract awarded pursuant to this contract are subject to appropriations by the Stafford County Board of Supervisors to satisfy payment of such obligations. The County's obligations to make payments during subsequent fiscal years are dependent upon the same action. If such appropriation is not made for any fiscal year, the contract shall terminate effective at the end of the fiscal year for which funds were appropriated and the County will not be obligated to make any payments under the contract beyond the amount appropriated for payment obligations under the contract. The County will provide contractor with written notice of non-appropriation of funds 30 days after action is completed by the Board of Supervisors, but failure to give such notice shall be of no effect and the County shall not be obligated under the contract beyond the date of termination specified in the County's written notice.

10i. TERMINATION FOR CONVENIENCE. A contract may be terminated in whole or in part by the County in accordance with this clause whenever the Procurement Director determines that such a termination is in the best interest of the County. Any such termination shall be effected by delivery to the contractor of a Notice of Termination specifying the extent to which performance shall be terminated and the date upon which termination becomes effective. An equitable adjustment in the contract price shall be made for completed service, but no amount shall be allowed for anticipated profit on unperformed services.

10j. TERMINATION OF CONTRACT FOR CAUSE. If, through any cause, the contractor fails to fulfill in a timely and proper manner its obligations under the contract, or if the contractor violates any of the covenants, agreements, or stipulations of the contract, the County shall have the right to terminate the contract. Any such termination shall be effected by mailing or delivery to the contractor of a Notice of Termination specifying the extent to which performance shall be terminated and the date upon which termination becomes effective. In such event all finished or

unfinished documents, data, studies, surveys, drawings, maps, models, and reports prepared by the contractor under the contract shall, at the option of the County, become its property and the contractor shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents. Termination of the contract for cause does not relieve the contractor of liability to the County for damages sustained by the County by virtue of any breach of contract by the contractor until such time as the exact amount of damages due to the County from the contractor is determined.

10k. DELIVERY/SERVICE FAILURES.

A. In case any items are defective in material or workmanship or otherwise not in conformity with the requirements of the, the County shall have the right either to reject them (with or without instructions as to their disposition) or to require their correction.

B. Items which have been rejected or required to be corrected shall be removed or, if permitted or required by the Procurement Administrator, corrected in place by and at the expense of the contractor promptly after notice, and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed.

C. If the contractor fails promptly to remove such items which are required to be removed or promptly to replace or correct such items, the County may either (i) by contract amendment or otherwise, replace or correct such items and contractor shall reimburse the County, within a reasonable time specified by the Procurement Administrator, for any reasonable expense incurred in excess of the contract prices; or terminate the contract for default as provided below.

D. Unless the contractor corrects or replaces such items within the delivery schedule, the Procurement Administrator may require the delivery of such items at a reduction in price, which is equitable under the circumstances.

E. Acceptance or rejection of the goods shall be made as promptly as practicable after delivery, except as otherwise provided in the contract; but failure to inspect and accept or reject goods shall neither relieve the contractor from responsibility for such goods as are not in accordance with the contract requirements nor impose liability on the County. The inspection and test by the County of the goods does not relieve the contractor from any responsibility regarding defects or other failures to meet the contract requirements which may be discovered prior to acceptance.

10l. SUBLETTING OF CONTRACT OR ASSIGNMENT OF CONTRACT FUNDS. It is mutually understood and agreed that the contractor shall not assign, transfer, convey, sublet or otherwise dispose of his or her contractual duties to any other person, firm or corporation, without the previous written consent of the Procurement Administrator. In no case shall such assignment of contract relieve the contractor from its obligations or change the terms of the contract.

10m. PAYMENTS TO SUBCONTRACTORS.

A. The contractor is obligated to take one of the two following actions within seven days after receipt of amounts paid to the contractor by the County for work performed by any subcontractor under the contract (i) pay the subcontractor for the

proportionate share of the total payment received from the County attributable to the work performed by the subcontractor under the Contract; or (ii) Notify the County and the subcontractor, in writing, of the contractor's intention to withhold all or a part of the subcontractor's payment with the reason for nonpayment.

B. The contractor is obligated to pay interest to the subcontractor on all amounts owed by the contractor to the subcontractor that remain unpaid after seven days following receipt by the contractor of payment from the County for work performed by the subcontractor under the contract, except for amounts withheld as allowed in subparagraph (ii), above. Unless otherwise provided under the terms of the contract, interest shall accrue at the rate of one percent per month.

C. The contractor shall include in each of its subcontracts, if any are permitted, a provision requiring each subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower-tier subcontractor. The contractor's obligation to pay an interest charge to a subcontractor pursuant to this paragraph may not be construed to be an obligation of the County. A contract modification may not be made for the purpose of providing reimbursement for such interest charge. A cost reimbursement claim may not include any amount for reimbursement for such interest charge.

D. All contractors, if a proprietorships, partnerships, and/or corporations, shall provide the County with its federal employer identification number, or if an individual contractor, their social security number.

10n. AUDIT OF RECORDS. The parties agree that County or its agent must have access to and the right to examine any books, documents, papers, and records of the contractor involving transactions related to the contract or compliance with any clauses thereunder, for a period of five (5) years after final payment. The contractor must include this requirement in all subcontracts related to the contract.

10o. GENERAL GUARANTY. Contractor agrees to:

A. Save the County, its agents and employees harmless from liability of any nature or kind for the use of any copyrighted or uncopyrighted composition; secret process, patented or unpatented; invention; article or appliance furnished or used in the performance of a contract for which the contractor is not the patentee, assignee, licensee or owner.

B. Intentionally Omitted

C. Protect the County against latent defective material or workmanship and to repair or replace any damages or marring occasioned in transit or delivery.

D. Furnish adequate protection against damage to all work and to repair damages of any kind to the building or equipment, to his or her own work or to the work of other contractors, for which his or her workers are responsible.

E. Pay for all necessary permits, licenses and fees and give all notices and comply with all laws, ordinances, rules, regulations, and policies of the County.

F. Protect the County from loss or damage any County-owned property while it is in the custody of the contractor.

10p. SERVICE CONTRACT GUARANTY. Contractor agrees to:

A. Intentionally Omitted

10q. INDEMNIFICATION.

A. General Indemnification: Contractor must indemnify, keep and save harmless, and defend the County, its agents, officials, employees and volunteers against claims that may accrue or arise against the County as a result of the granting a contract, if the claim was caused by the negligence or error, or omission of the contractor, its employees, its subcontractor, or its subcontractor's employees. As used in this Section, a claim includes: injuries, death, damage to property, breach of data security, suits, liabilities, judgments, or costs and expenses. Upon request by the County, the contractor must at its own expense: appear, defend, and pay all attorney's fees and all costs and other expenses related to the claim. If, related to a claim, any judgment is rendered against the County or a settlement reached that requires the County to pay money, the Contractor must at its own expense satisfy and discharge the same. Contractor expressly understands and agrees that any performance bond or insurance protection required by this Contract, or otherwise provided by the Contractor, does not limit the Contractor's responsibility to indemnify, keep and save harmless, and defend the County as provided in this contract.

B. Intentionally Omitted

C. Right to Participate in Defense. The County may, at its sole expense, participate in the defense or resolution of a Claim. Contractor will have primary control of the defense and resolution of the claim, except when such defense or resolution requires the County to (i) admit liability or wrongdoing; or (ii) to pay money. In either of these cases contractor must obtain the County's prior written consent before entering into such settlement or resolution.

D. No Indemnification by the County. The parties agree that under applicable law the County cannot indemnify or defend the contractor. To the extent any promise or term contained in this contract, including any exhibits, attachments, or other documents incorporated by reference therein, includes an indemnification or obligation to defend by the County, that promise or term is stricken from this contract and of no effect.

10r. CONTRACTOR STATUS. The contractor is an independent contractor and neither the contractor nor its employees or subcontractors will, under any circumstances, be considered employees, servants, partners, or agents of the County except for such purposes as may be specifically enumerated herein, nor shall anything contained in the contract be construed to create any partnership or joint venture between the parties. The contractor is solely responsible for the employment, selection, management, and supervision of its own participants and for ensuring that its participants abide by all applicable rules for security, safety and general conduct. The contractor shall maintain exclusive control over its operations. The County will not provide to the contractor any insurance coverage or other benefits, including workers' compensation, normally provided by the County for its employees.

10s. NON-DISCRIMINATION. During the performance of this contract, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

B. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.

C. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

D. The Contractor will include the provisions of the foregoing paragraphs A, B, and C above in every subcontract or purchase order of over $10,000 so that the provisions will be binding upon each subcontractor or vendor.

10t. DRUG FREE WORKPLACE. During the performance of a contract, the Contractor agrees to (i) provide a drug-free workplace for the Contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract of over $10,000, so that the provisions will be binding upon each subcontractor or vendor. For the purposes of this section, "drug-free workplace" means a site for the performance of work done in conjunction with a specific contract awarded to a Contractor in accordance with this section, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

10u. IMMIGRATION REFORM AND CONTROL ACT. Contractor agrees that it does not, and shall not during the performance of the contract for goods and services in the Commonwealth knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

10v. NONVISUAL ACCESS. Intentionally Omitted

10w. CONTRACT ALTERATIONS: The contract documents set forth the entire agreement between the County and the contractor. The County and the contractor agree that no representative or agent of either of them has made any representation or promise with respect to the parties' agreement which is not contained in the contract documents. No contract document may be amended unless in writing, signed by the parties hereto, and approved as to form by the County Attorney.

10x. CONTRACTUAL DISPUTES.

A. Any dispute concerning a question of fact as a result of the contract shall be decided by the County Administrator, or designee, who shall render his/her decision in writing and mail or otherwise forward a copy to the contractor within 90 days of the receipt of the claim. The decision of the County Administrator, or designee, shall be final and conclusive unless the contractor appeals the decision as provided in the Code of Virginia (1950, as amended). The contractor may not institute a legal action, prior to receipt of the County Administrator's, or his/her designee, decision on the claim, unless the County Administrator, or designee, fails to render such a decision within the time specified.

B. The contractor's contractual claims, whether for money or other relief, shall be submitted in writing to the County Administrator, or designee, no later than 60 days after the final payment; however, written notice of the contractor's intention to file such a claim shall have been given at the time of the occurrence or beginning of the work upon which claim is based. Nothing herein shall preclude the contractor from submission of an invoice for final payment within a certain amount of time after completion and acceptance of the goods and/or services. Pendency of claims shall not delay payment of amounts agreed due in the invoice for final payment.

10y. LEGAL ACTION. No bidder or potential bidder, or contractor shall institute any legal action until all statutory requirements have been met.

10z. VENUE. This contract and its terms, including but not limited to, the parties' obligations, the performance due, and the remedies available to each party, are governed, construed, and interpreted in accordance with the laws of the Commonwealth of Virginia. Any jurisdiction's choice of law, conflicts of laws, rules, or provisions that would cause the application of any laws other than those of the Commonwealth of Virginia do not apply. Any and all disputes, claims, and causes of action arising out of or in any way connected with this contract or its performance must be brought in the applicable court of Stafford County, or in the United States District Court for the Eastern District of Virginia, Alexandria Division.

10aa. GRANT AND FEDERAL FUNDS PROVISION. When a project or purchase of goods and services is funded in part or all by grant funds, the Contractor shall observe all rules and regulations according to the grant fund award documentation. Contractor has the responsibility to comply with all grant fund reporting requirements and any or all award documentation terms and conditions. In addition, the project or purchase of goods or services funded in whole or in part by the federal government are subject to the requirements of 2 C.F.R. §§ 200.317 – 200.326 and 2. C.F.R. Part 200, Appendix II, as amended.

11. SPECIAL TERMS AND CONDITIONS

1. Intentionally Omitted.

2. PREFERENCE FOR ENERGY-EFFICIENT AND WATER-EFFICIENT GOODS

When in the course of procuring goods, if two or more bids for products that are **Energy Star certified, meet Federal Energy Management Program (FEMP) designated efficiency requirements, appear on FEMP's Low Standby Power Product List, or are Water Sense certified, the County may only select among those bids unless, before selecting a different bid, the County provides a written statement that demonstrates the cost of the products that are Energy Star certified, meet FEMP-designated efficiency requirements, appear on FEMP's Low Standby Power Product List, or are Water Sense certified was unreasonable.**

12. REFERENCES

The bidder is required to state, in detail, in the space provided below what work of a character similar to that included in the proposed Contract has been done, to give references and such other detailed information as will enable the County to judge his responsibility, experience, skill and financial standing. Bids from Contractors inexperienced in this particular type of work will not be considered.
Please provide in the spaces below, the name(s) of the project(s), a point of contact for each project, and current contact information for the point of contact.

1. _____

2. _____

3. _____

4. _____

5. _____

13. TRADE SECRETS/PROPRIETARY INFORMATION IDENTIFICATION

IF NO PROTECTION IS NEEDED STATE "N/A" ON THE TABLE BELOW AND SIGN.

Trade secrets or proprietary information submitted by any Bidder/Offeror in connection with a procurement transaction shall not be subject to public disclosure under the Virginia Freedom of Information Act, however, the Bidder/Offeror must invoke the protection of §2.2-4342(F) of the Code of Virginia, in writing, prior to or upon submission of the data or other materials, and must clearly and specifically identify the data or other materials to be protected, and state the reasons why protection is necessary. **The proprietary or trade secret material submitted must be identified by the Bidder/Offeror on the table below. If the Bidder/Offeror fails to identify any protected information on the table below, the Bidder/Offeror by return of this form, hereby releases the County and all of its employees from any and all claims, damages, demands or liabilities associated with the County's release of such information, and agrees to indemnify it for all costs, expenses and attorney's fees incurred by the County as a result of any claims made by Bidder/Offeror regarding the release of such information. By submitting its bid or proposal, Bidder/Offeror understands and agrees that any language seeking protection from public disclosure, any specific documents or information, unless identified on the table below, are null and void and of no legal or binding effect on the County.** The classification of line item prices, and/or total bid prices as proprietary or trade secrets is not acceptable. If, after being given reasonable time, the Bidder/Offeror refuses to withdraw such a classification designation, the bid/proposal will be rejected.

SECTION/TITLE	PAGE NUMBER(S)	REASON(S) FOR WITHHOLDING FROM DISCLOSURE

By (Signature in Ink) _____ Date: _____

Name (print) _____ Title (print) _____

14. SMALL AND MINORITY BUSINESS ENTERPRISES

The Procurement Policies and Regulations of Stafford County, Virginia and relevant Federal and State Laws, Orders and Regulations, require Stafford County to ensure that its procurement practices are non-discriminatory and promote equality of opportunity for Small, Women-Owned, Minority-Owned, and Service Disabled Veteran-Owned (SWaM) Business Enterprises.

Definitions:

1. Small Business:

   For the purposes of this document a small business concern is one which, regardless of ownership or control:

   (a) does not exceed two-hundred and fifty (250) employees.; or
   (b) gross annual income does not exceed ten (10) million.
   (c) is independently owned and operated (not subsidiary of another firm).

2. SWaM Business:

   A business entity which is operated and controlled by a SWaM entity.

   (a) The terms "operated and controlled" shall mean that the managerial and official staff of this entity shall be comprised of minority persons, sufficient in ratio and gross earnings to demonstrate that the business transactions are, in fact, controlled by minority persons; and that the primary power, direct or indirect, to influence the management of this entity shall rest with minority persons or a corporation, partnership, or sole proprietorship in which minority persons collectively own operate, control and share in earnings of fifty one (51%) percent or more of such an enterprise.
   (b) SWaM entities shall be defined as provided in Virginia Code § 2.2-4310, as amended.

PLEASE CHECK THE FOLLOWING INFORMATION RELEVANT TO YOUR FIRM:

SWaM Business Firm:	Yes _____	No ____
Small Business Firm:	Yes _____	No ____

The above information is requested for statistical purposes only. All firms tendering responses will receive equal consideration for award.

CONTACT FOR ADMINISTRATION:

NAME: _____

ADDRESS (OFFICE): _____

TELEPHONE (OFFICE): _____

15. VIRGINIA STATE CORPORATION COMMISSION (SCC) REGISTRATION INFORMATION.

The Bidder, _____:

☐ is a corporation or other business entity with the following SCC identification number:

_____ **-OR-**

☐ is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust **-OR-**

☐ is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the offeror in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from offeror's out-of-state location) **-OR-**

☐ is an out-of-state business entity that is including with this proposal an opinion of legal counsel which accurately and completely discloses the undersigned offeror's current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

****NOTE**** >> Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for proposals (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver): ☐

_____ _____

Authorized Signature Date

_____

Title

END OF BID DOCUMENT

ATTACHMENT
B

STAFFORD COUNTY

DEPARTMENT OF UTILITIES

WATER AND SEWER

DESIGN AND CONSTRUCTION STANDARDS

APRIL 2017

DEPARTMENT OF UTILITIES

WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS

ISSUE DATE: February 15, 2017

RECOMMENDED BY: Jason D. Towery, P.E.
Director of Utilities

Signature

APPROVED BY: Thomas C. Foley
County Administrator

Thomas C. Foley
Signature

EFFECTIVE DATE: April 1, 2017

Promulgated in accordance with Ordinance O96-16
Supersedes Standards Dated March 2006

TABLE OF CONTENTS

SECTION 1

GENERAL WATER AND SEWER STANDARDS

GENERAL WATER AND SEWER STANDARDS

1.1 GENERAL REQUIREMENTS

1.1.1 Introduction

The Stafford County Water and Sewer Design and Construction Standards set forth the requirements that govern the design and construction of all water mains, sanitary sewers and wastewater pumping stations that will become part of the County's public water and sewer system.

It is the County's desire to encourage qualified professionals to seek new and better solutions to complicated technical problems. However, in the interest of orderly controlled development and expediting the processing of plans and construction, certain standard procedures and the use of these design standards are necessary.

This manual is supplementary to the Virginia Waterworks Regulations and the Virginia Sewage Collection and Treatment Regulations and to the requirements of other local, State and Federal Agencies having jurisdiction. Where conflicts exist, the more stringent requirements shall apply. Nothing herein shall be deemed to waive or modify other requirements of existing regulations and law. It is encouraged that conflicts be brought to the attention of the Director of Utilities.

The Director of Utilities, in administering these standards, shall treat them as mandates rather than guidelines unless the language clearly specifies otherwise. The Director may allow for a variation of a given standard where the effect of such variation is in keeping with established engineering practice and procedure. Variations from mandatory policies or requirements will not be permitted. In all cases, deviations from these Standards must be specifically called out and shown on the project plans. Approval of the project plans by the Director of Utilities is approval of the deviation only if the deviation is identified as such on the project plans.

Users of these standards should keep in mind that it is the goal of the County to provide to its customers the best public water and sewer system available. Design engineers, material suppliers and construction contractors should consider their efforts to be no less than would be acceptable to them if they were the owner, operator and maintainer of the system. All public utility construction in Stafford County shall be equal to or better than these standards.

Comments or suggestions on this document should be submitted in writing to the Product and Design Review Committee.

1.1.2 Project Plans Review and Permitting

All project plans shall be submitted to the County for review in accordance with Section 22-76 and Article XIV of the County Code. Project plans are generally submitted to the Department of Planning for review by affected agencies and departments. The applicant shall follow Department of Planning procedures in submitting new and revised project plans

for review. After all comments have been resolved, the applicant shall submit project plans to the Department of Planning for signatures and distribution of approved project plans. Should a project involve only the Department of Utilities, the Department of Utilities may direct the applicant to submit project plans directly to the Department of Utilities for review and approval.

Detailed review will be performed by VDOT and Stafford County.

Under provisions established by the VDH, the County has local review and approval authority for water mains of twelve inch (12") diameter and smaller.
All project plans containing water mains larger than twelve-inch (12") diameter, water pumping stations, or water storage tanks must be submitted to VDH for review and approval. These plans will be submitted to the VDH by the County after review and comment by the County.

The County will review all sanitary sewer projects. No sanitary sewer project may be constructed in Stafford County without formal approval by the County. Sewer lines 12 inches and smaller in diameter are waived from the requirement for DEQ review, although the County does not have local review authority from DEQ.
All project plans containing gravity sewer mains or force mains larger than twelve-inch (12") diameter, wastewater pumping stations, low pressure sewer systems with grinder pumps maintained by the homeowner, or vacuum sewer systems, must be submitted to DEQ for review and approval. These plans will be submitted to the DEQ by the County after review and comment by the County.

Project plans approval is valid for a period of twelve (12) months from the date of approval. If the construction is not in progress at the end of that period, or if construction becomes inactive for a period of twelve (12) months, the project plan approval shall become void. Project plans then will have to be resubmitted as a new project, if deemed necessary by the County, to conform to the most current Standards.

After approved project plans are received by the Department of Utilities, the owner may apply for a water/sewer construction permit from the Department of Utilities. The construction application form will be prepared by the Department of Utilities and shall include the owner's certification that a civil engineer has been retained to certify construction as required by Section 1.1.12.E and to provide Record Drawings. A sample form is included at Appendix 2. The owner shall obtain an original form from the Department of Utilities, complete Sections I and II, and return the application form to the Department of Utilities a minimum of five working days before a construction permit is requested. The Department of Utilities will retain the form until an officially approved set of plans is received from the Planning Department, after which it will be available for payment and issue. A complete application for the construction permit (i.e. approved and paid for) shall be in the hands of the Department of Utilities a minimum of two (2) County working days prior to the commencement of construction. No construction of any kind involving water and/or sewer facilities shall be performed until all fees have been paid and the Department of Utilities has issued a construction permit.

In addition to the Department of Utilities construction permit, the owner/developer is responsible for obtaining all other required permits from all other regulatory agencies, such as VDOT, DEQ, and VDH before construction can be started. All permits and an approved set of project plans shall be available for inspection by the utility inspector at the construction site.

1.1.3 Utility Coordination

The design engineer shall coordinate water and sewer design with storm drains and all other utility design and construction so that there are no conflicts. The location of both future and existing utilities must be shown on the construction plans and profiles.

The design engineer shall be responsible for obtaining precise locations of all existing utilities and physical features through field surveys and current record locations. It may be necessary for the engineer to dig test holes to verify existing utility line locations. The test hole information shall be shown on the plan and profile views.

The contractor shall call "Miss Utility" at 811 at least 48 hours in advance of initiation of construction.

1.1.4 Definitions and Abbreviations

The following definitions and abbreviations are included for reference.

Definitions

Board	Stafford County Board of Supervisors.
Department Director	Stafford County Department of Utilities
Engineer	The professional engineer or qualified licensed surveyor responsible for the project plans and specifications.
Project Plans	The site plan, subdivision plan or public improvement documents containing the construction drawings and specifications for water and/or wastewater systems.

Abbreviations and Symbols

Reference to a technical society, institution, association, governmental authority or design parameter is made in accordance with the following abbreviations:

AASHTO	American Association of State Highway and Transportation Officials
AGC	Associated General Contractors of America, Inc.
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
DEQ	Virginia Department of Environmental Quality

fps	feet per second
gpm	gallons per minute
ISO	Insurance Services Office
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
psi	pounds per square inch
SSPC	Steel Structures Painting Council
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation
VUSBC	Virginia Uniform Statewide Building Code
WEF	Water Environment Federation
VESCH	Virginia Erosion and Sediment Control Handbook

All definitions of Section 25-1 of the Stafford County Code are included by reference.

1.1.5 Soil Erosion and Sediment Control

The installation of water and sewer mains and the construction of water and wastewater pumping stations are subject to Chapter 11 of the Stafford County Code, Erosion and Sediment Control. No project shall begin until the proper permits are obtained and the required erosion and sediment control devices are in place and functioning. Erosion and Sediment control measures must be shown on the project plans.

1.1.6 Easements

Water and sewer utilities that will become the property of the County, and that do not lie wholly within a public right-of-way, shall require exclusive easements dedicated to the County for public use. In specific cases when a 20 foot wide exclusive easement would not allow sufficient room for other parallel utilities such as electricity, gas, telephone or cable television, a 10 foot wide exclusive water-sanitary sewer easement centered on the water or sanitary sewer line may be allowed by the department with the remaining easement designated as no-exclusive.

Before site plans, subdivision construction plans, infrastructure plans, or other plans that include water and/or sewer construction can be approved by the Department of Utilities, all off-site easements for water and sewer lines to be constructed from the plans must be obtained and recorded with the grantee being the County of Stafford. Final subdivision plats cannot be filed until all easements necessary for water and sewer service for the project are obtained and recorded.

When deemed necessary by the Director and in order to assure maximum utilization of the public water and/or sewer system, easements shall be extended to adjacent properties. Sizes, elevations, and alignments of water and sewer mains and appurtenances shall be designed to include adjacent parcels. Where future water or sewer main construction may adversely affect nearby residents or will be logically required in the future, the Director may require that water and/or sewer mains also be extended to adjacent properties. It may also be necessary that appropriate easements be provided to allow adjacent properties access to

water and sanitary sewer lines. In order to assure routine and emergency maintenance, access (ingress/egress) easements shall be provided.

Water mains may be constructed on private property provided that the property owner has provided a duly recorded easement with a minimum width of 20 feet centered on the water main. Increased easement widths may be required by the Director due to line size or access requirements.

Sewer mains may be constructed on private property provided that the owner has provided a duly recorded easement with a minimum width of 20 feet centered on the sewer main. The minimum easement width between houses or other structures shall be 25 feet. Where feasible, the easement between houses or other structures shall be on common property and not on the lots where the structures are located.

Where a 25-foot easement on common property is not feasible for sewer mains located between houses or other structures, the minimum easement width shall be 25 feet with the sewer main centered within the easement. In addition, the following restrictions shall apply:

1. The 25-foot easement shall be located entirely upon one of the two adjacent properties.

2. Deed restrictions shall be recorded for the property the easement is located upon including, at a minimum:

    a. A prohibition against the planting of any shrubs, trees, or plantings other than grass within the easement

    b. A prohibition against the location of any structures within the easement

    c. A prohibition against the erection of any fencing across the width of the easement that prohibits access to the easement for maintenance or repair of the sewer main.

    d. A gate that easily opens to provide a passage of at least 20 feet in width may be installed in the easement.

Where the sewer is in excess of 10 feet deep and located in open and less-densely developed areas or between houses or other structures, the easement width shall be increased on a 1 to 2 depth to width ratio.

Where a water-sanitary sewer easement is originally intended or is planned to contain two or more pipes, the easement shall be increased 10 feet in width for each pipe exceeding one width for all pipes 10 feet from the edges of the easement.

All easements shall be restored as nearly as possible to their original condition after construction. An acceptable ground cover shall be sown or planted and necessary measures to prevent erosion shall be completed within 30 days of pipe installation.

1.1.7 Protection of Public Utilities

The owner or developer of private property where water and/or sewer lines will be laid shall be responsible for ensuring that manhole covers, valve boxes, etc. are not covered or damaged. It shall be the responsibility of the owner or developer to replace pavement, sidewalks, and other improvements damaged or removed by the County while performing any maintenance functions within a dedicated easement located on private property. Examples include: Shopping centers, private roads, parking lots, or other private property.

Changes of grade, fences, buildings, and other permanent structures shall not be constructed within a water or sewer easement unless the Director grants specific permission. No shrubs, landscaping, or other obstacles shall be placed within a water or sewer easement that would render the easement inaccessible for equipment. Trees may not be placed in an easement under any circumstances. The Department of Utilities is not responsible for any damages to any structures, landscaping, or other facilities that have been placed within a water or sewer easement.

1.1.8 Inspections

In accordance with Section 25-80 of the County Code, all water and sewer construction work shall be inspected by the Department of Utilities.

1.1.8.1 Inspections in General

The owner, developer, or contractor shall employ a certified testing firm to conduct laboratory soils testing and field density testing for all backfill operations. The contractor shall schedule soil sampling and laboratory testing for all backfill materials sufficiently in advance so that results are available in the field before each material is used. The contractor shall ensure that a trained soils technician is on site at all times when backfill operations are in progress. For utility trenches, each lift shall be tested at intervals not exceeding 100 linear feet. More frequent testing shall be conducted if directed by the Utilities Inspector. Field reports shall be provided to the Utilities Inspector on a daily basis. Copies reviewed by a Professional Engineer shall be provided to the Utilities Inspector on a bi-weekly basis with a statement as to whether the compaction meets project requirements. At the end of construction, the engineer shall certify that all compaction involving utility work met project requirements. Any underground construction not inspected and approved prior to backfilling will be required to be removed and reinstalled before acceptance.

1.1.8.2 Testing for Construction under Pavements in VDOT Right-of-Way

Stafford County will test the installation of waterlines, sanitary sewers, and appurtenances to be located under pavements as follows:

A. Test Methods

The following test methods will be used:

1. VTM-1: Laboratory Determination of Theoretical Maximum Density Optimum Moisture Content of Soils, Granular Subbase and Base Materials.
2. VTM-10: Determining Percent of Moisture and Density of Soils and Asphalt (Nuclear Method).
3. VTM-12: Use of One-Point Proctor Density
4. AASHTO-T191: Standard Method of Test for Density of Soil In-Place by the Sand Cone Method.

B. Testing Frequency

Testing Frequency will be in accordance with VDOT Materials Division Manual of Instruction Section 309, Project Sampling Testing and Inspection Section 309.01 Density Control:

1. Section (5) Backfill for pipes. The test pattern for pipes requires the test pattern to begin at 6" above and will continue for each compacted 6" lift until the fill reaches design pavement subgrade or existing ground surface, whichever is lower. The lifts will continue until the top of the ground with select material that conforms to Sec 303 of the VDOT Materials Manual. The test frequency will be no greater than every 300 feet for fill material above the pipe. If there is less than 200 feet of pipe in a single segment or placed on a single day, then one density test for every two lifts shall be performed.

2. Section (9) Backfill for Manholes: Manholes shall have a minimum of one test (around the perimeter of the structure) every fourth 6" compacted layer until the top five feet of the structure. The test pattern after the first 4" compacted layer above the bedding will continue in 6" inches compacted lifts to the top on the structure. In the top five feet one test of every other lift around the perimeter of the structure is required.

C. Qualifications of Technicians

Field technicians must complete the VDOT Soils and Aggregate Compaction School for a VDOT Soils and Aggregate Certification. In addition, if there is concrete work associated with water or sanitary sewer construction, the field technician must complete the VDOT Concrete Field School for a VDOT Concrete Materials Certification.

D. Reporting Forms

Reporting forms shall conform to forms listed in VDOT Materials Division Manual of Instruction Section 317, Summary of Minimum Acceptable Sampling Requirement:

a. TL-55 Report of Nuclear Test Section
b. TL-125 (Sand-Cone Method)

c. TL-125A (One Point Proctor Method)

E. Report Submissions

Stafford County must submit the above reports, sealed by a professional engineer licensed in the Commonwealth of Virginia, to VDOT on a biweekly basis.

The county will submit one copy of all reports to:

Area Land Use Engineer (North)
VDOT Fredericksburg District
86 Deacon Road
Fredericksburg, VA 22405

1.1.9 Materials

All materials shall be approved by the Stafford County Department of Utilities and listed on the Approved Products List where such a category exists on the list. See Chapter 6 for an explanation of the list and procedures for submitting products for approval. All materials incorporated into projects shall be new and meet the applicable manufacturing standards for each respective product.

1.1.10 Revisions of Approved Project Plans

In the event that an owner or developer desires to deviate from project plans that have been approved by the Director, or to make any changes or revisions therein, he shall make a request for authorization to do so to the Director, in writing, and state the reasons for the request. Revised project plans and other substantiating data shall accompany the request in such manner, form and quantity as was required for the original applications.

The Director has the authority to require the owner or developer to make changes in the types of materials and methods of construction if the actual field conditions are different from the conditions shown on the project plans.

1.1.11 Violations

When a utility inspector determines that a violation has occurred under the terms of these Standards, the inspector shall verbally notify the person in charge and specify what is required to correct the deficiency and when the correction is to be completed.

If the violation is not corrected in the time specified, the County may immediately serve notice of violation upon either the permittee or his agent in person or by registered or certified mail. Such notice may set forth the measures that must be completed in order to comply with these Standards and may specify a date by which such measures must be completed.

If the violation is not corrected by the specified date, the Director may take one or more of the following actions:

A. Request the Commonwealth's Attorney to prosecute for conviction and fine or imprisonment pursuant to the appropriate statute;

B. Request the County Attorney to obtain an injunction to cease a continuing violation;

C. Revoke the construction permit;

D. Issue a stop work order for that portion of the work; and/or

E. Authorize the Department of Utilities to perform emergency corrective work at the contractor's expense.

1.1.12 Tentative Acceptance Inspection

At the completion of construction of any water and/or sewer project and after all other utilities, such as electricity, gas, telephone, and cable TV, are installed, the developer or owner responsible for construction shall notify the Director, in writing, that the work has been completed and request a tentative acceptance inspection. This request shall include the requirements of section 1.1.12.E. Upon sufficient justification, the Director may waive the requirement that all other utilities be installed prior to the tentative acceptance inspection.

Prior to the tentative acceptance inspection, the Contractor shall clean up the site of the work, including all rights-of-way, leaving it in as clean, neat and sanitary condition as originally found, and shall remove all machinery, tools, surplus material, temporary buildings, and other structures from the site of the work.

Tentative acceptance inspections that are postponed due to contractor’s failure to properly clean up the site may result in the assessment of additional charges to the developer/owner for the inspection.

Upon receipt of the request for a tentative acceptance inspection, the Director will make a comprehensive inspection of the constructed facilities, examining in detail for conformance of the work with approved project plans, alignment of sewer lines, infiltration leakage, workmanship, operation of equipment and other factors to the satisfaction of the Director and the best interest of the County.

A responsible representative of the developer or owner must accompany the Director or his designee on the tentative acceptance inspection provided for in this section. The developer or owner shall furnish whatever is necessary for conducting the inspection.

Deficiencies that are found to exist during the tentative acceptance inspection will be pointed out to the developer or owner. Subsequent to the inspection, the developer or owner will be furnished, in writing, a summary of the deficiencies found, the correction of which is required. Upon notification that all construction deficiencies have been corrected, the Director may re-inspect all such work.

1.1.13 Acceptance by County of Completed Facilities

The Director will accept newly constructed water and sanitary sewer service facilities into the public utilities system of the County upon satisfaction of the following conditions:

A. In the opinion of the Director, all certifications required by Sections 1.1.6 and 1.1.8 have been received and all requirements of Section 1.1.11 have been fulfilled or the developer or owner has made arrangements satisfactory to the Director to have them fulfilled.

B. A set of record drawings meeting the requirements of Section 1.2.3 has been submitted and approved by the Director.

C. All matters relative to specific contracts between the developer or owner and the County are in order.

D. Payment has been made by the developer or owner for all fees relative to applications and inspections.

E. A civil engineer registered as a Professional Engineer in the Commonwealth of Virginia certifies that the work has been completed in accordance with the approved plans and specifications.

F. Explicit written understanding exists between the developer or owner and the Director that the developer or owner shall be responsible for and obligated to correct any deficiencies in construction for a period of one year from the date of tentative acceptance of the facilities by the county. This condition will be stipulated in the written form of acceptance issued by the Director.

Acceptance of the newly constructed facilities, when approved by the Director, will be made, in writing, to the developer or owner responsible for the construction. The issuance of the written forms of acceptance of any such facilities shall constitute an irrevocable agreement between the developer or owner responsible for construction and the Director that the Board of Supervisors, acting for the County and any of its officers, agents, servants, or employees, shall be saved harmless by the developer or owner from liability and responsibility of any nature and kind for the cost of, or payment for, labor and equipment used in construction of the accepted facilities or on account of any patented or unpatented invention, process, article or appliance manufactured for, or used in construction with the intended operation of, the accepted facilities.

Certificate of occupancy permits will not be issued for any buildings within any subdivision or development until the water and sewer facilities have been accepted in accordance with this Section.

Upon tentative acceptance of the improvements, the developer's or owner's security may be reduced to ten percent (10%) of the original security amount.

Deficiencies that are found to exist during the tentative acceptance inspection will be pointed out to the developer or owner. Subsequent to the inspection, the developer or

owner will be furnished, in writing, a summary of the deficiencies and the corrective actions required. Upon notification that all construction deficiencies have been corrected, the Director may re-inspect all such work.

1.1.14 Twelve Month Inspection

Within 12 months of the date of Tentative Acceptance, the Department of Utilities will re-inspect all items covered by the Tentative Acceptance Inspection. A responsible representative of the developer or owner will be invited to accompany the Director or his designee on the inspection. Deficiencies that are found to exist will be pointed out to the developer or owner. Subsequent to the inspection the owner will be furnished, in writing, a summary of deficiencies found, the correction of which is required. Upon notification that all deficiencies have been corrected, the Director may re-inspect the work. When all deficiencies have been corrected, and upon application to the County's Security Officer, the developer's maintenance security will be returned.

1.1.15 Final Inspection

Final inspection of the constructed water and sewer facilities will occur not less than one year after acceptance of the facilities and when final road paving has been completed.

Upon receipt of the request for a final inspection, the Director will make a comprehensive inspection of the constructed facilities, examining in detail for conformance of the work with approved project plans, alignment of sewer lines, infiltration leakage, workmanship, operation of equipment and other factors to the satisfaction of the Director and the best interest of the County.

A responsible representative of the developer or owner shall accompany the Director or his designee on the final inspection provided for in this section. The developer or owner shall furnish whatever is necessary for conducting the inspection.

When the Director has determined that the final inspection has been satisfactorily completed, the Director will release all security for the water and sewer improvements within the project.

1.2 PROJECT PLANS

1.2.1 General Instructions

Construction drawings shall be submitted on standard 24" x 36" sheets. Drafting media shall be bond paper. Tracing paper or sepias are not acceptable. Plans submitted for electronic plan review shall be in PDF formats.

A cover sheet is required and shall contain the Owner's name and address, project title in large, distinctive letters, a vicinity map with a minimum area of 144 square inches drawn where possible on a scale of 1 inch equals 2,000 feet to indicate the general vicinity of the contemplated construction, an index to the plan sheets, and the signed stamp of the Owner or principal of the design engineering firm.

1.2.2 Construction Drawings

The construction drawings shall include a set of key sheets drawn at an appropriate scale. The key sheets shall show the location of all sewer manholes, direction of flow, valves, fire hydrants, flushing hydrants, sampling stations, water main sizes, sewer main sizes, type and class of pipe, and road crossings.

When a project will be constructed in phases and/or sections, the drawings shall clearly show the phase and/or section lines.

The drawings shall include a schedule for location of sewer house connections to include the station location, length, grade, invert elevation, ground elevation and depth at the property line.

The scale to be used for all drawings shall be as follows:

Plan Views: 1" = 50' (1" = 30' for high density multi-family developments)

Profiles: 1" = 50' Horizontal
1" = 10' Vertical (maximum)
1" = 5' Vertical (minimum)

Generally, each sheet shall be so oriented that the north arrow points towards the top or towards the left side of the sheet.

Coordinates, based upon the Virginia State Plane Coordinate North System (NAD 83) shall be shown on all plan sheets. Vertical control shall be based on NAVD 88.

Drawings will be acceptable only if all lines and lettering thereon are concise, legible, reproducible, and are readily capable of being digitally reproduced.

Notes shall not be placed in hatched or shaded areas. Crowding of notes into a small space shall be avoided. Leaders shall be used to clarify the item referred to. Notes should not be scattered all over the drawing, but should be neatly grouped together.

All lettering for the same set of plans shall be of the same style, open, well-formed, dense black and have a consistent density throughout the entire drawing. Minimum height of letters shall be:

Notes - 1/8" and legibly spaced.
Titles - 1/4".

Each plan set shall include an existing condition sheet(s) clearly showing all existing utilities, pavements, easements, structures, and topography.

Each plan sheet shall contain one or more plan sheets showing proposed water and sanitary sewer infrastructure and easements. Proposed water mains and appurtenances, fire hydrants,

water services, sewer mains, manholes, sewer house connections (laterals) water-sanitary sewer easements shall be shown with bold lines. All water and sanitary sewer lines shall be stationed. All other existing and proposed infrastructure, including all existing and proposed easements, stormwater infrastructure, property and right-of-way lines, pavements landscaping, lighting, topography and other features as appropriate shall be shown in a legible, but greyed out lines. Excess notes not related to water or sanitary sewer construction and callouts may be deleted if shown elsewhere in the plan set.

All water and sanitary sewer lines shall be shown on a dedicated plan and profile sheets. Plan features shown on overall utility plan sheets as described above shall be shown on the plan view. For curved alignments, the radius of curvature, and the number and degree of deflection of all included deflected joints shall be shown.

The profile view for water at a minimum shall include the following features: ground profile over the waterline, all fittings, restrained lengths for all compound lengths, type of pipe, class or thickness of pipe.

The profile view for sanitary sewer at a minimum shall include: ground profile over the sewer, sewer pipe labeled with length, slope, pipe material, thickness designation and specification reference, manholes with invert elevations in and out, rim elevation, and diameter.

1.2.3 Record Drawings

A complete set of Record Drawings and corrected key sheets shall be submitted by the developer or owner responsible for the construction upon completion of construction and approved by the department at least one week prior to the anticipated occupancy of any building within the project and as a condition of tentative acceptance of the water and sanitary sewer systems in the project. Construction drawings shall be digitally modified to reflect as-built conditions. Record drawings shall be determined by actual field survey and sealed by the responsible engineer. The following statement signed by the responsible design engineer shall be on the title sheet, "I hereby state, to the best of my knowledge and personal belief, that the work shown on these plans was constructed to County standards to the directions and grades shown and are either installed within the Public right-of-way or properly recorded easements dedicated to Stafford County." The record drawings shall show all revisions, substitutions, variations, omissions, and discrepancies made or discovered during construction concerning location and depth of utilities, piping, manholes, pumps, and other facilities. Revisions shall be made and shown on all drawing views with actual dimensions established to permanent points. The contractor shall keep daily as-built work plans at the construction site and shall furnish them to the design engineer for record drawing preparation.

The record drawings shall show, but may not be limited to, the following:

1. Water Line Construction:

    a. Accurate scale location on plans of the line and all installed valves and fittings, such as elbows, tees, crosses and reducers, and all cradle encasements, restrained joints or special construction.

b. Exact measurements to show positive locations for valves shall be taken from at least two reasonably adjacent and available, fixed and permanent objects, such as fire hydrants, centers of sanitary or storm sewer manhole casting covers, corners or lines extending from buildings, power poles, etc.

c. Manufacturer.

d. Materials, class, specification and sizes of all pipes.

e. Location of house service measured from the side property line.

2. Sewer Line Construction:

a. Accurate scale location of manhole inverts and top casting elevations and numerical notations of the exact elevations of same as determined by field survey after construction. Elevations shall be in datum of the County.

b. Accurate scale indication of lengths and grades and direction of lines between manholes and numerical notations of the exact length and grades, as determined after construction.

c. Accurate scale location of concrete cradles, encasements or special construction.

d. Location of house services by measurement from the manhole immediately downgrade.

e. Manufacturer.

f. Materials, class, specification and sizes of all pipes.

3. Wastewater pumping stations, water pumping stations, all other comparable construction and building structures:

a. As-built plans and specifications shall accurately indicate all approved deviations from or changes in locations or type of equipment installed and material used.

b. Pump curves shall be drafted onto the plan set.

c. Accurate listings of the names of the manufacturers of all operating equipment installed, together with model or style numbers, ratings, capacities and other pertinent information shall be provided as part of the record plans on the project.

d. At least three (3) complete sets of operation and maintenance manuals for all operating equipment and all certificates of inspections, warranties and guarantees of equipment, materials and the installation thereof, required by the project

specifications which are approved by the Director, shall be provided as part of the record drawings on the project.

When the record drawings information differs from the approved construction plans, a design analysis for the existing conditions may be required.

One set of record drawings shall be submitted to the Department of Utilities on 24"x36" bond paper. After the record drawings are approved in writing by the Department of Utilities, one set of full-sized prints and digital drawings in both, PDF and Autocad format, shall be submitted.

1.2.3.1 Submission of Record Drawings

Digital file shall be submitted in one of the following formats:

DXF
ACAD Release 2010 or later, as the Director may require from time to time

All files shall have an organized layer scheme including easy to understand layer names. The following is the desired layout of themes: (Place existing and new construction on different layers)

Sewer
- Manholes
- Sewer (Sewer Lines)
- ARV (Air Relief Valves)
- Pump (Pump Station)
- Forcemain

Water
- Blowoff
- Hydrant
- Junction (Node at pipe intersections)
- Reducers
- Valves
- Pipe
- ARV (Air Relief Valves)

1.3 WATER AND SEWER DESIGN STANDARDS

1.3.1 Protection of Water Supplies

There shall be no cross connection between a drinking water supply and a sewer, or appurtenance thereto.

No sewer line shall pass within 50 feet of a drinking water supply well, source, or structure unless special construction and pipe materials are used to obtain adequate protection. The

proposed design shall identify and adequately address the protection of all drinking water supply wells, sources, and structures within 100 feet of the proposed project.

1.3.2 Separation of Water and Sewer Lines

Separation shall be measured between outside of pipes.

1.3.2.1 Water Lines Crossing Over Sewers

Water lines crossing over sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of the sewer whenever possible. When conditions prevent an 18-inch vertical separation, the said portion of sewer shall be constructed of AWWA C900, or C905, pressure tested in place without leakage prior to backfilling.

1.3.2.2 Water Lines Crossing Under Sewers

Water lines passing under sewers shall be protected by providing a vertical separation of at least eighteen inches (18") between the bottom of the sewer and the top of the water line; adequate structural support for the sewer to prevent excessive deflection of the joints and the settling on and breaking of the water line; and the length of the water pipe shall be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer and the said portion of sewer shall be constructed of AWWA C900 or C905 water pipe, pressure tested in place without leakage prior to backfilling.

1.3.2.3 Water and Sewer Mains Parallel

Where water and sewer mains must run parallel, sewer mains shall be a minimum of 18 inches below the water mains. Additionally, there shall be ten feet (10') of clearance horizontally between the water and sewer mains whenever possible. This distance shall be measured edge-to-edge.

When local conditions prevent a horizontal separation of at least ten feet (10’), the water line may be laid closer to a sewer provided that:

A. The water main is in a separate trench located on one side of the sewer.

B. The bottom of the water line is at least 18 inches above the top of the sewer.

C. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe pressure tested in place without leakage prior to backfilling. The hydrostatic test shall be conducted in accordance with most recent edition of the AWWA standard, with a minimum test pressure of 30 psi.

D. Water mains shall be at least 10 feet from septic tanks and septic drain fields.

1.3.2.4 Water and Sewer Mains Crossing Other Utilities

Water and sewer mains shall have minimum clearance of 18 inches where crossing other utilities.

1.3.2.5 Manholes and Sewers

No water pipe shall pass through or come in contact with any part of a sewer manhole. Manholes shall be placed at least ten feet (10') horizontally from a water main whenever possible. The distance shall be measured edge-to-edge of the pipes or structures. When local conditions prohibit this horizontal separation, the manhole shall be of watertight construction and tested in place and the sewer main shall be constructed of AWWA C900 or C905 water pipe, pressure tested in place without leakage prior to backfilling.

No pits, valve boxes or flushing devices shall be directly connected to a sanitary or storm sewer.

1.3.3 House Service Separation

Water service lines shall have at least ten feet (10') of clearance horizontally from the sewer service line; vertically the water service line shall be above the sewer service line with at least eighteen inches (18") of clearance.

Where conditions prohibit the separation described above, the water service may be placed in the same trench with the sewer service line provided approval is given by the Director and the conditions listed below are met:

A. The bottom of the water service line at all points shall be at least 18 inches above the top of the sewer line at its highest point.

B. The water service line shall be placed on a solid shelf excavated at one (1) side of the common trench and at least 18 inches horizontally from the sewer service line.

C. The number of joints in the service pipe shall be kept to a minimum.

D. The materials and joints of sewer and water service pipe shall be installed in such a manner and shall possess the necessary strength and durability to prevent the escape of solids, liquids, and gases therefrom under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations and superimposed loads.

1.3.4 Relationship with Other Utilities

Utility lines and equipment of other utilities shall be installed no closer than five feet (5') horizontally from the County's water and sewer lines or facilities. Any utility lines crossing over or under water and sewer lines shall be no closer than 18 inches vertical distance and properly identified with a marker or other means of identification approved by the Director. If other utilities must cross water or sewer lines within 18 inches, concrete encasement of the water or sewer line shall be required.

1.3.5 Protection of Roadways

All water mains, gravity sewers, pressure sewers and force mains under major roads shall be installed in a steel casing in accordance with Detail 1.4.2-2A or 1.4.2-2B. The casing shall extend five feet (5') beyond the pavement. A major road is any four lane divided road or any other road or street with a planned vehicle count greater than 1,000 vehicles per day.

1.3.6 Water and Sanitary Sewer Lines Under Pavements in VDOT Rights-of-Way

With the permission of VDOT and the Director, water and sanitary sewer lines and appurtenances may be placed under pavements in VDOT rights-of-way. Permission to place water and sewer under pavement will be limited to residential projects with a maximum lot size of 10,000 square feet and with setback limitations of 30 feet or less in the following zoning districts: A-2, R-1, R-2, R-3, R-4, PD-1, PD-2, P-TND, and UD; and only during initial construction. The design of the water or sanitary sewer utilities shall be in conformance with VDOT's Road and Bridge Standards and Stafford County's Water and Sewer Design and Construction Standards. Water and Sanitary Sewer utilities will be allowed per VDOT Road Design Manual App B1 and evaluated on a case-by-case basis. In case of a conflict, the more stringent requirement shall govern. Utilities shall be located outside the right-of-way whenever it is practical to do so.

Where permission to construct water and sanitary sewer lines under pavements is granted, sewer services and waterline services to all lots shall be installed as part of the initial construction so as to eliminate the need for future excavation in paved areas to install services. All water and sewer services shall, at a minimum, extend to the Right-of-Way line.

1.3.7 Installation Under Streams

Waterlines, gravity sewers, pressure sewers and force mains shall be installed a sufficient depth under the stream bed to protect the pipe. In general, one foot of suitable cover shall be provided where the stream is located in rock and three feet of suitable cover in other materials. Less cover may be considered if the pipe is encased in concrete or steel casing.

1.3.8 Valves

All Valves, including hydrants sampling station and other appurtenances shall close clockwise and open counterclockwise. Valves shall not be located in sidewalks or curb and gutter sections.

Depending on the shape, soils, characteristics of the stream and stream flow, some form of stream protection may be required. These forms may include vegetative or structural techniques as approved by the Director.

1.4 WATER AND SEWER CONSTRUCTION STANDARDS

1.4.1 Safety

It is the requirement of OSHA, VOSHA and these standards that all safety measures including but not limited to trenching, confined space, traffic control and other applicable safety measures be strictly adhered to and enforced by the contractor.

1.4.2 Sheeting, Shoring and Bracing

The contractor's attention is called to Rules and Regulations Governing the Safety and Health of Employees Engaged in Construction as adopted by the Safety and Health Codes Commission of the Commonwealth of Virginia and all latest revisions thereto and issued by the Department of Labor and Industry.

The contractor shall perform all construction operations in accordance with the U.S. "Occupational Safety and Health Act of 1970", the Standards of the U.S. Department of Labor, Occupational Safety and Health Administration and the latest amendments thereto.

The contractor shall provide sheeting, shoring and bracing as required to assure safe working conditions, maintain required excavation dimensions for proper construction, and to prevent accidents, cave-ins, and damage to adjacent structures, facilities and surfaces.

Sheeting, shoring, and bracing shall:

A. Conform with Federal law, State law, and County ordinances.

B. Conform with the recommendations set forth in AGC "Manual of Accident Prevention in Construction."

C. Be used where needed to protect life, property, and the work.

D. Be used to avoid excessively wide cuts in unstable material or along public roads.

E. Be mandatory where construction is adjacent to existing buildings, utilities, and other structures which sloped side walls might damage or destroy.

Sheeting and shoring left in place shall be cut off to a depth of not less than 18 inches below grade.

1.4.3 Trenching and Backfilling

Trenches shall be excavated so as to provide a uniform and continuous bearing and support for the full length of the pipe. Bell holes shall be provided at each joint and coupling to permit proper joint assembly and pipe support. For waterlines smaller than 18 inches in diameter, the bottom of the trench shall be shaped to fully support the pipe. Rock shall be removed when encountered to a minimum depth of six inches (6") below the pipe, and the same depth below the bell. Material in the bottom of the trench deemed unsuitable by the Director shall be removed and replaced with compacted gravel backfill. Depth and width of removal shall be as directed by the Director.

Before the pipe is lowered in place, the trench bedding shall be prepared so that each pipe will have a firm and uniform bearing over the entire length of the barrel. Adjustments in line and grade shall be made by scraping away or filling and tamping in under the barrel of the pipe. Wedging or blocking is not permitted.

Unless otherwise authorized by the Director, no more than 100 feet (100') of trench may be open at any one time. The Director may require backfilling and subsequent re–excavation of trenches left open an unreasonable amount of time in advance of pipe installation. Trenches left open overnight, or during periods when the Contractor's forces are not present shall be so protected and enclosed and marked as to cause no danger to the public or others.

Sides of trenches in improved public rights-of-ways and adjacent to other utilities or structures shall be practically plumb. Sides of trenches in other areas may be sloped from a point one foot above the top of the pipe to grade. Slopes shall be such as will not allow displacement of material or danger to personnel. Sides of trenches from a point one foot above the top of the pipe to the bottom of the trench shall be practically plumb. Bell holes shall be excavated in the bottom of the trench wherever necessary to permit the proper assembling of joints.

Large rocks, boulders, and large stones shall be removed to provide a clearance of at least six inches (6") below and on each side of all pipe, valves and fittings for pipe twenty-four inches (24") in diameter or less, and nine inches (9") for pipes larger than twenty-four inches (24") in diameter. The specified minimum clearances are the minimum clear distances which will be permitted between any part of the pipe and appurtenances being laid and any part, projection or joint of such rock or stone.

Excavations shall be kept free of water once construction has begun until the trench has been backfilled. If water is encountered, the contractor must provide and maintain a dewatering system of sufficient capacity to remove water until the excavation has been made, the pipe has been placed and bedded, and the excavation has been backfilled.

1.4.4 Pipe Installation

The Contractor shall, after excavating the trench and preparing the bedding for the pipe, furnish necessary facilities for lowering and placing sections of the pipe in the trench without damage. The sections of pipe shall be fitted together in accordance with the manufacturer's requirements and shall be laid true to line and grade. The full length of the barrel of the pipe shall have a uniform bearing upon the bedding material. Care shall be exercised to prevent damage to the polyethylene encasement, if provided. PVC pipe shall be installed in accordance with ASTM D2774 and AWWA C-605 for pressure pipe and ASTM D2321 for non-pressure piping. Ductile Iron Pipe shall be installed in accordance with AWWA C600.

1. Pipe shall be laid to grade. Pipe that is not in true alignment, both vertical and horizontal, or shows undue settlement after laying shall be replaced. No pipe shall be laid which is damaged, cracked, checked, or spalled or has other defects deemed by the County to make it unacceptable, and such sections shall be permanently removed from the work.

2. When the work of installing pipe is not in progress, openings into the ends of the pipelines shall be kept tightly closed with suitable plywood or sheet metal bulkheads.

3. Keep the pipe trench free from water and take necessary precautions to prevent the pipe from floating due to water entering the trench. Damage is the Contractor's responsibility. Restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

The installation of water and sewer utilities located under pavements in VDOT Rights-of-Way, shall be in accordance to chapter three (Geotechnical Engineer) of the VDOT Materials Division Manual of Instruction
http://www.virginiadot.org/business/resources/bu-mat-MOI-3.pdf
(Reference Specs. 520, 401 & 309, 308, 302-305, 232, 208, 207, 205, VDOT Road and Bridge Specifications) and Stafford County Department of Utilities Water and Sewer Design and Construction Standards", which specification is most stringent or which standard is most pertinent to the method of construction in respect to VDOT field inspector or VDOT construction engineer.

1.4.5 Backfilling

Pipe backfill materials shall be as indicated in the standard details and as specified below:

1.4.5.1 Backfilling in General

Pipe Bedding Material: Pipe Bedding shall be VDOT size 57 per Section 203, Table II-3, VDOT Road and Bridge Standards, having a maximum ½" particle size. Backfilling shall be compacted in four-inch (4") layers.

Select Backfill: Select Backfill shall be classified as SM, SC, or better in accordance with ASTM D2487, free from rock or gravel larger than two-inches (2") in any dimension, debris, waste, frozen material, organic material, and other deleterious matter. The plasticity index shall be less than 15 and the liquid limit shall be less than 40. Backfilling shall be in 6-inch (6") layers.

Controlled Fill: Controlled Fill shall be placed above Select Backfill or Bedding materials in areas requiring filling to grade, road embankments and berms. Materials for Controlled Fill shall consist of any approved material imported or excavated from the cut areas and shall contain at least 40 percent of material smaller than ¼ inch in size. No material of a perishable, spongy, or otherwise improper nature shall be used in backfilling. Backfilling shall be in six-inch layers.

Structural Fill: Structural Fill shall be placed in six-inch (6") layers above Select Backfill or Pipe Bedding materials in areas requiring pavement and/or vehicular traffic above the pipe trench. Structural Fill shall consist of crushed stone conforming to size 21 or 21A, VDOT specification Section 208, Table II-9.

Select Backfill, Structural Backfill and Pipe Bedding Material:

1. Each layer shall be evenly spread; the moisture content brought to near optimum conditions and then compacted to a density that is not less than 95 percent of maximum density at optimum moisture content in accordance with VDOT (1991) Specification Section 303.04.

2. The Contractor shall use appropriate compaction equipment that will not result in damage to adjacent ground, existing improvements, or newly installed improvements.

3. Flooding, jetting, or ponding will not be permitted for compaction of any backfill.

Controlled Fill:

1. Controlled Fill shall be compacted while at a moisture content near the optimum and to a density that is not less that 90 percent of the maximum density at optimum moisture content in accordance with VDOT (1991) Specification Section 303.04.

2. Potentially expansive soils may be used in fills and shall be compacted at moisture content greater than the optimum for the material. Otherwise expansive soils shall be below a depth of 24 inches.

3. When the moisture content of the fill material is below that specified, water shall be added until the moisture content is as specified.

4. When the moisture content is above that specified, the fill material shall be aerated by blading, mixing, or other satisfactory methods until the moisture content is as specified.

5. After each layer has been placed, mixed, and spread evenly, it shall be compacted to the specified density. Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic tires, or other types of acceptable compacting equipment. Equipment shall be of such design that it will be able to compact the fill to the specified density. Compacting shall be continuous over the entire area, and the equipment shall make sufficient passes over the material to ensure that the desired density had been obtained.

6. Surface of fill slopes shall be compacted so that the slopes are stable and there is no excessive loose soil on the slopes.

7. The Contractor shall provide and maintain adequate erosion control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the permanent drainage system and vegetation is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the Contractor's responsibility to prevent the discharge of sediment off-site or to adjacent watercourses.

Compaction beneath and within 25 feet (25') of buildings and structures, including those shown for future construction shall be 100 percent as determined by VTM-1. Compaction beneath pavements, walks, and road shoulders, including those shown for future construction shall be 95%. Compaction in all other unpaved areas shall be 90%. The

contractor shall provide the Director satisfactory test results of the backfill performed by a qualified laboratory to demonstrate compliance with the above. The plans shall specify the frequency of testing for the various areas; minimum test frequency shall be every 100 feet of trench length per lift. Backfill and replacement in existing or proposed roads to be accepted into the State Highway System shall be executed in full accordance with the requirements of the VDOT.

1.4.5.2 Backfilling Under Pavements in VDOT Rights-of-Way

Trenches shall be constructed in accordance with Stafford County details 1.5.2-1 to 1.5.2-6 as appropriate or VDOT requirements if more stringent. Materials shall conform to the following:

1. Controlled Fill

    a) Materials placed with roadbed Fill soils shall consist of suitable imported or on-site soils approved by VDOT for use in the roadway prism.

    b) Materials placed in a trench excavated in the roadway prism: Fill soils shall consist of suitable imported or on-site soils as determined by the County Engineer and approved and accepted by VDOT. Suitable materials for fill shall consist of any approved material imported or excavated from the cut areas, shall contain no rocks or gravels greater than two inches (2") in size, and shall contain at least 40 percent of material smaller than one-fourth inch (1/4") in size. No material of a perishable, spongy, or otherwise improper nature shall be used in filling. Materials classified as SM or SC in accordance with ASTM D2487 shall be used.

2. Select Backfill

    a) Imported materials placed under pavement: VDOT 21A

    b) All other areas in VDOT Right-of-Way: Materials classified as SM, SC, or better in accordance with ASTM D2487, free of rock or gravel larger than two inches (2") in any dimension, debris, waste, frozen materials, organic material, and other deleterious matter. The plasticity index shall be less than 15 and the liquid limit shall be less than 40.

3. Bedding

    a) Watermains: VDOT 21A only where required to adjust final grades.

    b) Sanitary sewers: VDOT No. 57 stone

4. Unsuitable Material

Any material that contains more than 5% be weight organic matter, or that has unstable bearing capacity, excessive moisture content, roots, mulch, debris, waste, or frozen materials.

1.4.6 Tunneling

When tunneling is necessary to lay pipelines, the tunnels shall be of sufficient size to permit the proper jointing of pipes and the proper grouting or compacting of the backfill around them, if it is required. All methods of tunneling shall be subject to the approval of the Director. In general, tunnels shall be of timbered (cap and leg), steel liner plate, or jacked construction. When conditions require a specific type to tunneling, the details of such construction will be indicated by the design engineer on the construction drawings.

1.4.7 Casing Pipe

Install casing pipe to the grades, and alignments shown on the project documents. The method used to advance the boring machine shall ensure correct alignment and grades at all times without binding or imposing excessive loads on the initial tunnel supports or upon the surrounding ground. Deviations from the specified line shall not exceed three inches (3") in any direction at any point in the casing.

The casing pipe shall be ASTM A53 Grade B welded and seamless steel pipe with minimum yield strength of 36,000 psi and a minimum wall thickness of 0.500 inches.

Proprietary casing systems may be considered on a case by case basis.

Upon request of the Utilities Inspector, the contractor shall provide certifications for welders and casing pipe. In all cases, the inspector shall be allowed the opportunity to inspect the inside of the casing by television or other means prior to installation of the water or sewer pipe. Seal the ends of the casing pipe using an approved end seal.

SECTION 2

WATER SUPPLY SYSTEMS STANDARDS

WATER SUPPLY SYSTEMS STANDARDS

2.1 WATER MAINS AND APPURTENANCES

2.1.1 Hydraulic Design

Water distribution systems shall be designed to provide adequate flow and pressure for both domestic supply and fire flow based upon sound hydraulic analysis. The system shall be designed to provide the following:

A maximum of 80 psi within any structure served by the system. For limited areas, individual pressure reducing valves may be used to reduce the pressure to 80 psi, a minimum of 40 psi within any structure served by the system during a peak day, peak hourly demand with the hydraulic grade line for the service area thirty feet (30') less than maximum. For limited areas, individual booster pumps may be used to increase the pressure to 40 psi, a minimum of 20 psi for fire flow during maximum daily flow period, with the hydraulic grade line for the service area thirty feet (30') less than the maximum, the ability to sustain the required fire flows for a minimum of three hours.

The hydraulic analysis shall utilize the following factors:

1. 240 gallons per day per equivalent dwelling unit average daily demand.
2. 2.5 peak hour demand factor.
3. 1.5 maximum day average hour demand factor.

The level of service of existing customers shall not be reduced. Maximum and minimum pressures shall be calculated by the Design Engineer for the dynamic and static head conditions that will occur at both the street and throughout the proposed building.

Upon receiving a written request the Utilities Department will provide computer simulation results for flow and pressure availability for the existing system to the developer or the developer's engineer. The developer or developer's engineer shall provide a report containing a detailed analysis for evaluation by the Utilities Department to ensure that the proposed water system design meets the above requirements for hydraulic design.

The minimum requirements for the report as follows:

1. Cover sheet with title of project, date and PE seal.
2. Original data provided by the Department of Utilities.
3. Network files for pipes, nodes, simulated pump curve and reservoir at point of connection. Pipe table shall contain pipe number, connecting nodes, length, C factor, diameter, and minor loss coefficient. Node table shall contain node number, elevation, and average demand.
4. Pipe and node exhibit with pipes and nodes identified.
5. Model runs at peak hour.

6. Table of fire flows at 20 psi residual pressure at maximum day average hour for all fire hydrants. Model runs may be needed with two hydrants flowing.
7. Complete node, pipe and simulated pump output for one scenario for items 5 and 6.
8. In addition to the information in item 3, the node table shall list hydraulic grade line and pressure.
9. In addition to the information in item 3, the pipe report shall include flow, unit head loss, and total head loss.

If a project will be developed in sections or phases, the fire flow calculations will indicate the available fire flows during each section or phase of the project. For small sites that propose no major water line extensions, an evaluation of the existing fire flows may be substituted for the fire flow calculations. Water lines will be interconnected wherever feasible to enhance the reliability and operation of the water system.
If the Stafford County water transmission system cannot provide the above pressures, the property owner will be required to furnish storage and/or on-site pumping systems as necessary to obtain desired service pressures. If the pressure exceeds the maximum, the property owner will be required to furnish and install a pressure-reducing valve on the premise. Construction plans shall indicate the lots that will require the installation of either an on-site booster pump or a pressure-reducing valve.

The Director may require the use of pipe and fittings with increased pressure ratings in areas where the pressure exceeds 80 psi.

2.1.2 Location

Provisions shall be made for logical future extensions. In new subdivisions with curb, gutter and sidewalks, the water mains shall be constructed within one of the driving lanes of the street with VDOT approval. In all other new subdivisions, the water main shall be constructed along the shoulder of the street approximately 3 feet from edge of proposed pavement. Water mains constructed in easements shall be constructed along the center of the easement. Future extensions shall be provided with a restrained gate valve and a minimum of one length of pipe sufficient to reach beyond any pavements. This pipe shall be properly plugged, blocked, disinfected and pressure tested along with the rest of the water system. After passing inspection the gate valve shall be closed. Water lines that are allowed under the pavement of undivided roadways, shall be located in the center of travel lane unless, as determined by VDOT, there are compelling design or safety issues that would demand consideration of an alternate location. The waterline positioning will provide ten (10) feet separation from the sewer lines as required by the Virginia Department of Health (VDH).

2.1.3 Water Main Sizes

The minimum size of water mains shall be as follows:

A. As shown in the Stafford County Water and Sewer Master Plan.

B. Sufficient to meet the fire flow requirements of Section 2.1.5.

C. In single-family residential districts, eight inch (8") shall generally be used; six inch (6") to be used only when it completes a good hydraulic grid and, generally does not exceed six hundred feet (600') in length. Dead-ends shall be eliminated by looping when feasible.

D. In other areas, twelve inch (12") shall generally be used; eight inch (8") to be used only when it completes a good hydraulic grid and, generally does not exceed six hundred feet (600') in length.

E. For length of pipe runs less than 300 feet where there are no plans for extensions, 2-inch (2") pipe may be used.

F. For areas where there are no plans to provide fire protection, pipes smaller than 6 inch (6") may be used.

Hydraulic design of water mains shall be based on pipe carrying capacities consistent with head losses determined in accordance with the Hazen-Williams Formula using a C value of 120. The maximum allowable flow velocity is 5 feet per second for domestic flow. All losses through valves, tees, and other appurtenances will be computed and added to determine total head loss through the water distribution system.

2.1.4 Fire Hydrants

Fire hydrants spacing shall be measured along lines of vehicular access. Fire hydrants shall be located as follows:

A. At street intersections and at intermediate locations where necessary, as determined by the Fire Marshal's Office. The maximum distance between hydrants on the same main, as measured along the center line of accessible streets, shall not exceed eight hundred (800) linear feet. A fire hydrant shall be located at the end of a cul-de-sac.

B. Within fifty feet (50') of any standpipe or sprinkler system fire department connection, where those systems are required in buildings.

C. The maximum distance from the fire hydrant to the most remote part of the structure the hydrant will serve, as measured along the centerline of the travel way shall not exceed the following:

Industrial Buildings	250 feet
School Buildings	300 feet
Commercial, Churches, & Office Buildings	50 feet
Apartments, Multi-Family, & Townhouses	250 feet
Single Family dwellings	500 feet

D. All hydrants shall be a minimum of fifty feet (50') away from buildings other than single-family dwellings and as required by 2.1.3.B.

E. Hydrants not at intersections shall be located in line with the property boundary between adjacent properties in order to avoid interference with future driveways.

F. For road sections of four lanes or more, the hydrant spacing for each side of the street shall be independent of the other.

G. Hydrants shall be located in such a way as to minimize damage by errant or turning vehicles.

H. In areas with curb and gutter, the center of the fire hydrant shall be not less than eighteen (18) inches nor more than eight (8) feet away from the face of the curb. Under no circumstances will any part of a fire hydrant conflict with or overhang any sidewalk, trail, or vehicular travel way. On roads with ditches, fire hydrants will be located behind the ditch.

I. No plantings or erection of other obstructions shall be made within four (4) feet of any fire hydrant or so as to block the view of the fire hydrant from the street.

J. When installed in parking areas, fire hydrants shall be protected by barriers that will prevent physical damage by vehicles. Clear access shall be provided to the front of and fifteen feet (15') either side of the fire hydrant.

Fire hydrants installed on private property behind fences are considered as not accessible for public use and therefore are part of the property owner's private fire protection system. Fire hydrants that provide private fire protection shall have a double check detector assembly installed at the property line in accordance with standard detail 2.2.3-1.

2.1.5 Fire Flows

All new on-site and off-site water supply systems shall have adequate capacity of delivering not less than the following fire flows with a residual pressure of not less than twenty (20) pounds per square inch at any point in the County's water system to the fire hydrants required by paragraph 2.1.4 (c). If a second fire hydrant is required by Section 2.15, the second fire hydrant must be located within 500 feet (500 ft.) of the most remote part of the structure they will serve. Where multiple hydrants are used to achieve the required fire flow, they shall be flowed simultaneously and the combined flow measured at twenty (20) pounds per square inch. These fire flows shall be in addition to the peak day domestic and commercial demands. In those cases where the source of supply cannot deliver fire flows at adequate pressures, the developer shall provide building sprinklers and fire resistive construction.

Distance Between Buildings	Single Hydrant to Meet Flow Requirements	Two Hydrants Within Five Hundred Feet of Structure to Meet Flow Requirements
One and Two Family Dwellings:		
31 Ft. and greater	1,000 GPM	1,000 GPM
11 Ft. - 30 Ft.	1,250 GPM	1,500 GPM
10 Ft. or less	1,500 GPM	2,000 GPM
Townhouses & Multiple Units:		2,500 GPM
Apartments, Hotels, Motels, Offices, Hospitals, Nursing Homes:		
1 - 3 Stories		2,000 GPM
Over 3 Stories		2,500 GPM
Schools:		2,500 GPM
Mercantile, Retail Stores, Shopping Center, etc.:		2,500 GPM
Industrial Storage Buildings, Repair Garages, Service Stations:		2,500 GPM

Notes:

1. In areas of mixed-use development, the higher fire flow shall govern.

2. Where the size and scope of the development exceeds these requirements, additional flow shall be provided in accordance with ISO (Insurance Services Office) requirements.

The available water storage system shall have adequate capacity to sustain required fire flows for a minimum of three (3) hours.

2.1.6 Sprinkler Systems

Structures protected by automatic sprinkler systems require installation of a double detector check, dedicated fire hydrant, and a Siamese connection. The double detector check valve for an automatic fire sprinkler system shall be installed at an accessible location inside the building and adjacent to an exterior door with a sprinkler room sign approved by the Fire Marshal's Office. Siamese connections must be located within 50 feet of the dedicated hydrant.

These requirements shall not apply to residential systems constructed under NFPA standard 13D, which requires the installation of a testable double check valve.

2.1.7 Flushing Hydrants

Fire hydrants shall be installed on dead-end lines, significant low spots and prominent peaks in water mains six inches (6") in diameter and above.

Flushing hydrants shall be used for water mains less than six inches (6") in diameter. Below grade hydrants as shown on Detail 2.4.4-3 shall be used in subdivisions and installed no more that eighteen inches (18") from the curb. Above ground hydrants as shown on Detail 2.4.4-4 shall be used in areas without curbs and gutters. Above ground hydrants shall be factory painted safety yellow, number 13655 in accordance with Federal Standard 595A.

Temporary flushing hydrants shall be used on dead ends that will be extended in the near future. Fire hydrants and above ground flushing hydrants shall be installed at the property line between two properties whenever practical.

2.1.8 Combination Air Vacuum and Air Release Valve

Combination air vacuum valves shall be installed at prominent peaks in long transmission mains and other water mains subject to collapse due to vacuum conditions.

2.1.9 Water Valves

Water valves shall have the same diameter as the water main to which they are connected.

Valves shall be installed at the intersection of water lines. Four (4) valves shall be used at crosses and three (3) valves at tees and shall be located as close to the fitting as practical. A valve shall also be installed at least every eight hundred feet (800') on water mains. Fire hydrant tee shall only have one valve on hydrant lead line.

Valves sixteen inches (16") or larger shall have beveled gears in enclosed gear cases.

Butterfly valves may be permitted in water mains fourteen inches (14") in diameter and larger.

2.1.10 Tapping Sleeves

Tapping Applications

a. The use of tapping sleeves and valves on the County water system will be considered where it can be shown that installation of a tee and line valve on the existing water main will not be beneficial to the County.

b. The stainless steel with mechanical joint ends with mechanical joint ends tapping sleeves may be used for any approved tap on C-900 PVC, C-905, and C909 or ductile iron water main, transite, or thin wall PVC.

c. The cast/ductile iron tapping sleeve may be used for approved two (or more) size down taps on C-900 PVC, cast iron or ductile iron water main.

2.1.11 Valve Boxes

All underground valve operators shall be equipped with valve boxes. Valve operator extensions shall be provided for operating nuts deeper than 9 feet to bring the operating nut to at least 24 inches but not more than 36 inches of the final grade. Valve box extensions shall be used to for the full depth of the valve. Valve box spaces shall be used to center the operating nut in the valve box.

Valve boxes in paved areas shall be set and adjusted so that the covers are exposed and flush with the street surface. All paving must be complete with valve boxes exposed and shall have Virginia Department of Transportation acceptance prior to final acceptance of the water line by the County.

Valve boxes in sodded and other off-street areas shall be set and adjusted so that the covers shall be exposed and flush with the immediate area. A concrete collar in accordance with detail 2.4.5-1 shall be installed. Valves should not be located in ditches.

2.1.12 Minimum Cover

All water mains shall be laid to a minimum depth of forty-two inches (42") from finished grade to the top of the pipe. Greater depths shall be required when street grades will possibly be lowered in the future. Water pipe shall not be laid at excessive depths. Water lines will not be laid at depths greater than eight (8) feet without the permission of the Director.

2.1.13 Potable Water Sampling Stations

Water sampling stations shall be installed in each subdivision, townhouse complex, apartment complex, and other such residential projects. Sampling stations shall be installed at the rate of one (1) station per 100 equivalent residential units, or fraction thereof. Where multiple stations are required, they shall be evenly distributed within the project.

2.1.14 Changes of Alignment

Changes of vertical and horizontal alignments shall be accomplished by the use of a combination of fittings and joint deflections. Bending of pipe lengths shall not be used. Joint deflections shall be limited to 80% of the manufacturer's recommended deflection, and shall be based upon the smaller of the recommended deflection of the pipe joint, fitting joint, or retaining gland.

Short vertical offsets to avoid conflicts with other buried objects shall be made using 45º vertical bends whenever possible.

Pipe installed on a horizontal radius using deflected joints shall be identified on the plan view with the design radius, tangent points, number of deflected joints and deflection per joint. Joints that are deflected in both the horizontal and vertical planes shall be labeled with the horizontal, vertical and total joint deflection.

2.2 WATER SERVICES

2.2.1 Water Service Connections

A separate water service, to include a tap to the public water main service line, isolation valve (for 2-inch and larger service lines) and meter setting, shall be provided for each parcel or lot. The minimum service line shall be 1 inch (1") in diameter. The location of each water service shall be clearly shown on the plans. The location of the water meter setting should be exterior to the structure and as near to the property line as possible and perpendicular to the water main. Where more than one water meter is provided for a building, separate meter settings shall be provided. The minimum separation between meter barrels shall be in accordance with detail 2.2.2-8.

One inch tap to water mains shall be installed using one inch corporation stops direct tapped to ductile iron and C900 DR14 PVC pipe or using a tapping saddle on cast iron, transite and all other PVC pipe. The minimum size meter setting for a non-residential structure shall be 2 inches. Taps larger than one inch (1") shall be made using a 4 inch branch tee for new work or 4" tapping sleeve and valve for existing work.

Water house connections serving a residential sprinkler system constructed under NFPA standard 13D shall conform to NFPA 13D Figure A.6.2(c) without a sprinkler control valve. The connection to the domestic water system shall be made inside the structure and protected by a testable double check valve. Flow characteristics of the water main tap, service lines, and all components of the meter setting shall be included in the design of the sprinkler system. The sprinkler system designer shall provide a signed statement regarding the adequacy of the water service planned for any residence proposing the use of a residential sprinkler system.

2.2.2 Water Meters

All house services shall have a water meter installed in accordance with the standard details. In residential areas the water meter shall be installed between the curb and sidewalk where practical or one foot behind the sidewalk. When curbs and sidewalks are not required, water meters shall be installed adjacent to the right-of-way at the property line.

Service lines one inch (1") or larger, with meters larger than five-eighth inch (⅝"), shall be sized in accordance with AWWA Manual M-22, Sizing Water Service Lines and Meters. Water meters shall be sized in accordance with AWWA Manual M-22 or the tables below.

For non-residential facilities such as hotels, motels, commercial buildings, restaurants, industrial facilities and public buildings, the meter will generally be sized as follows:

Meter Size Inches	Combined Fixture Value Total
⅝"	0-40
1"	41-100
1 ½"	101-624
2"	625-3600

The minimum meter size for facilities with flush valve water closets shall be 1-inch.

For residential facilities such as apartments, condominiums and trailer parks, the meter will generally be sized as follows:

Meter Size Inches	Combined Fixture Value Total
⅝"	1-36
¾"	37-209
1"	210-549
1 ½"	550-6900
2	6901-16300

Plumbing Fixtures Values shall be determined by using the latest edition of AWWA Manual M-22 Figure 4.6 for 35 psi.

Meter installations requiring a flow of greater than 160 gpm, or greater than the combined fixture value totals indicated above, shall be reviewed and/or approved on a case by case basis in accordance with AWWA Manual M-22.

2.2.3 Backflow Preventers

Each account shall have backflow prevention in accordance with Section 25-181 of the County Code. An approved cross-connection device shall be installed for each building. The device may be located in the meter barrel, in a separate meter barrel, or in the building depending on the type of backflow preventer required.

All private fire protection systems, including fire hydrants behind fences on private property, shall have a double check detector installed in a vault at the property line in accordance with detail 2.2.3-1.

Vault doors for double check detectors vaults shall be type "K" heavy-duty aluminum double leaf door designed for H2O loading. Door shall be tightly anchored to vault walls and provided with a lock satisfactory to the Director.

The double check detector assembly shall be supplied as a complete assembly consisting of the main-line double check assembly and the low flow by-pass line double check assembly complete with low flow registration meter. The main line assembly shall have two toggle-lever type, spring loaded check valves; two shut-off valves and four test cocks. The by-pass line assembly shall have two poppet type, spring loaded check valves, two shut-off valves,

three test cocks and a water meter. The by-pass checks and shut-off valves together with the water meter shall be assembled to the main line checks as an integral assembly.

Shop drawings for the double check detector assembly and vault shall be submitted to and approved by the Director prior to construction.

2.2.4 Private Water Service Connections

Private water service connections from the meter, starting at the connection to the short service line exiting the meter barrel, to the building are regulated by VUSBC and will be maintained by the property owner.

2.3 SURFACE WATER CROSSINGS

Surface water crossings, both over and under water, present special problems and shall be discussed with the Director before final plans are prepared. Surface water crossings will only be approved when no other alternative exists.

2.3.1 Above Water Crossing

The pipe for above water crossings shall meet the following:

A. Adequately supported (plans will include details of the piers and supports);

B. Protected from damage due to freezing;

C. Accessible for repair and replacement;

D. Above the 100 year flood level.

2.3.2 Under Water Crossing

Under water crossings shall meet the following:

A. The pipe shall be of special construction, having flexible watertight joints;

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

C. Sample taps shall be provided at each end of the crossing and at a reasonable distance from each side of the crossing and not subject to leaks.

D. Permanent taps shall be made for testing and locating leaks.

See Section 1.3.6 for additional requirements.

2.4 MATERIALS

2.4.1 Ductile Iron Pipe

Pipe shall be ductile iron meeting requirements of AWWA C151. Pipe shall be asphaltic coated outside and cement lined with double thickness and seal coated in accordance with AWWA C104. Unless otherwise indicated, the design thickness of the pipe shall be not less than the minimum shown in AWWA C150. Pipe shall be furnished in lengths of 18 to 20 feet and shall include all jointing materials. Installation shall be in accordance with AWWA C600.

All water mains either 12 inches (12") and greater in diameter or under paved areas shall be constructed of Ductile Iron Pipe unless otherwise approved by the Director.

Unwrapped ductile iron pipe shall not be used for a project unless a soil investigation in accordance with AWWA C105 is performed. Interpretation of results shall be made by the Director. If the soil investigation demonstrates that the soils would be corrosive to ductile iron pipe, the pipe shall be wrapped with polyethylene. Polyethylene encasement shall be in accordance with ASTM D1248 and AWWA C105 and shall be 8 mil thick.

2.4.2 Polyvinyl Chloride

Polyvinyl Chloride pipe (PVC) four inches (4") through ten inches (10") shall be minimum Pressure Class 200 (SDR 14) PVC water with "push-on" type joints meeting all requirements of AWWA C900. Outside diameter of the PVC pipe shall be the same as the outside diameter of cast iron water pipe meeting ANSI Specifications A 21.6. Installation of water mains and services shall be in accordance with AWWA C605.

PVC pipe two-inches (2") and three-inches (3") shall be ASTM D2241 SDR 21 (200 psi) certified for the transport of potable water. Joints shall be "push-on" type joints complying with ASTM D3139.

PVC shall only be used for water mains less than twelve inches (12") in diameter.

2.4.3 Copper Pipe

All water service lines less than two-inches (2") in diameter may be seamless, type K copper and meet requirements of ASTM B88. Fittings shall be bronze meeting requirements of AWWA C800. All couplings shall be made with compression joints as manufactured by Ford or approved equal. Flare fittings and sweated joints on copper tubing will not be permitted.

2.4.4 Cross Linked Polyethylene

Water service lines two inches (2") in diameter and smaller may be PEX-A. PEX-A shall meet the requirement of ASTM F876 and F877. Fittings shall be no lead brass meeting the requirements of AWWA C800. All couplings shall be made with compression joints and internal sleeves. Flare fittings will not be permitted.

2.4.5 High Density Polyethylene (HDPE)

High-density polyethylene pipe shall be minimum pressure class 160 (SDR11) in accordance with AWWA C906. HDPE pipe may be used only in applications specifically approved by the Director. Approved applications will generally be limited to steel-cased crossings and specifically approved directionally drilled trenchless technologies.

2.4.6 Fire Hydrants

Fire Hydrants shall be procured from the factory painted in accordance with the color listed below. They shall be installed as part of a complete assembly in accordance with standard detail 2.4.4-1.

Hydrants to be maintained by the utilities department and installed in dry areas with open weep holes safety yellow number 13655 in accordance with Federal Standard 595A.

Hydrants shall be painted red 11140 per Federal Standard 595A when owned and maintained by private entities." Any hydrant not in service shall be covered and secured with a black bag or other approved methods.

The bonnet (top) of each fire hydrant shall be painted to indicate the available fire flow in accordance with NFPA standards:

Fire Hydrant Bonnet (Top) Colors:

Blue – Rated capacity of 1500 GPM or greater
Green – Rated capacity of 1000-1499 GPM
Orange – Rated capacity of 500-999 GPM
Red – Rated capacity of less than 500 GPM
Purple – Non-potable, non-pressurized water supply

Hydrants that require repainting due to a change in the above color requirements identified after the construction permit is issued shall be repainted in field using paint approved for fire hydrants in the Approved Products List.

2.4.7 Water Valves and Tapping Sleeves

Gate valves shall be of superior quality ductile iron body with double disc parallel seat with full bronze mount. All gate valves shall withstand a working pressure of at least one hundred fifty (150) psi and shall be in strict conformance with AWWA C500. The wrench nut shall turn to the left (counterclockwise) to open the valve. The valves shall be arranged to fit into pipelines having standardized "push-on" or mechanical joints.

Gate valves for 6 inch through 12 inch pipe shall be resilient-seated gate valves built and tested in accordance with AWWA C509 and be gray or ductile iron body, bronze mounted, parallel seat, double disc with non-rising stem, nut operated to open left (counter-clockwise)

with a 2-inch square operating nut. Valves 6" through 12" must withstand a 200 psi working and 400 psi test pressure.

Butterfly valves can only be used for pipe with diameters of 14 inches and larger, and shall be built and tested in accordance with AWWA C504 and have iron bodies, rubber seats, and tight closure with standard two-inch square operating nuts. The valve shall be operable with a maximum input of 150 foot-pounds on the operating nut, and capable to withstand an overload input torque of 450 foot-pounds at full open and full closed positions without damage to the operator or valve.

All interior ferrous surfaces of all valves shall be coated in accordance with AWWA C550 using a coating approved by the Virginia Department of Health for contact with potable water and shall not contain lead, coal tar resins, lampblack, carbon black or bituminous materials. The exterior surfaces shall be epoxy coated or equal.

Tapping Sleeves:

Fabricated Steel:

a. The body of the tapping sleeve shall be of 3/8" carbon steel, ASTM grade A285.
b. All connections shall be mechanical joints.
c. The carbon steel body shall have a 12 mil thick coating of fusion-bonded epoxy. Bolts shall be 18-8, Type 304 - stainless steel.
d. Gaskets shall be Grade 60 compounded for use with water, alkalies, mild acids and most hydrocarbon fluids, up to 212 degrees F.

Stainless Steel:

a. The body of the tapping sleeve shall be of 18-8 type 304-stainless steel.
b. All connections shall be mechanical joints.
c. Gaskets shall be Grade 60 compounded for use with water, alkalies, mild acids and most hydrocarbon fluids, up to 212 degrees F.
d. Clamping hardware (nuts, bolts and washers) shall be 18-8 type 304-stainless steel, with plastic anti-gall washers. Drop-in bolts or welded-on studs are acceptable.

Fabricated Steel with Mechanical Joint Ends

a. Sleeve body, valve flange, gaskets, hardware and coating to be the same as the fabricated steel-tapping sleeve.
b. The mechanical joint glands to be ASTMA-36 iron or ductile iron.
c. The gland retaining hardware (nuts, bolts and washers) to be 18-8 type 304 stainless steel.

Cast Iron with Mechanical Joint Ends:

a. The body and glands of the tapping sleeve shall be of ASTM-126, Class B cast or ductile iron. Sleeve shall be furnished complete with all mechanical joint accessories (bolts, nuts, gaskets and glands) and shall have a bituminous seal coating.

Valve flange, body gaskets and clamping hardware (bolts, nuts and washers) shall be as specified for the fabricated steel tapping sleeve.

2.4.8 Valve Boxes

Valve boxes, base extensions, head and cover shall be of cast iron or locatable with metal locating devices. Valve boxes shall be two piece with 5.25 inch shaft and round head marked "Water". The shaft diameter shall not be less than five (5) inches. The valve boxes shall have a minimum range of extension to fit two (2) inch to twelve (12) inch valves inclusive, placed on mains at depths of three (3) feet to five (5) feet of cover in order that the top cover of the valve box is set to finished grade.

Valve boxes shall be centered over the valve operating nut with a valve box spacer and set plumb.

All valves in which the operating nut is greater than nine (9) feet below the normal ground or road surface shall be provided with extension stems to bring the operating nut between 24" and 36" of the finished grade. The extension stem shall be provided with a two inch square operating nut on top and a coupling to connect the extension to the operating nut of the valve. A stem guide shall be provided to keep the valve stem extensions concentric with the valve box. Extension stems shall be of the same diameter as the valve stem unless otherwise specified.

2.4.9 Fittings

Fittings shall be mechanical joint ductile iron with size, dimensions and tolerances meeting requirements of AWWA C153 or C110. Unless otherwise indicated, fittings 3 inch through 12 inch diameter shall have a pressure rating of 250 psi and all fittings larger than 12 inch diameter shall have a pressure rating of 150 psi. Mechanical joints shall meet requirements of AWWA C111. Provide all joint accessories, as required, to connect with plain end of push-on joint or cut pipe.

2.4.10 Valves

All valves on assemblies, such as vacuum air release assemblies shall be stainless steel, lever operated.

2.4.11 Grey Iron Castings

Valve boxes, water meter frames and covers, and all other gray iron castings shall conform to the patterns and dimensions shown in the Standard Details and shall meet requirements of ASTM Specification A-48, Class 30 except valve boxes shall be minimum class 20.

2.5 WATER MAIN CONSTRUCTION

2.5.1 Coordination

Existing County water valves shall be opened and closed only by or under the direct supervision of the Department of Utilities maintenance or inspection personnel. The only exception is an emergency situation affecting public health or safety.

Anyone found violating this provision might be subject to prosecution under the Code of Stafford for tampering with County property.

2.5.2 General Requirements

Load and unload pipe, fittings, valves, hydrants and accessories by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such material be dropped. Handle pipe such that the coating and lining shall not be damaged.

The water main shall be laid and maintained to the required lines and grades with fittings, valves, hydrants and accessories set at the required locations as indicated on the approved plans for the project. All valve and hydrant stems shall be set plumb. Whenever obstructions not shown on the plans are encountered during progress of the work and interfere to such an extent that alteration in plans is required, the Director or his authorized representative shall be advised by the design engineer and/or developer in writing and approval given by the Director before such alternatives are put into effect.

The design engineer shall prepare legible cut sheets at fifty feet (50') stations indicating all pertinent construction data to include locations of service connections, fire hydrants, valves, bends, fittings, and relief valves. A set of all cut sheets shall be submitted to the Department of Utilities prior to construction.

All construction must conform to the latest regulations and safety practices specified by the Occupational Safety and Health Administration.

2.5.3 Installation of Pipe and Fittings

Excavate trenches to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Backfill the bottom of the trench, excavated below the specified grade with approved bedding materials and thoroughly compact. The finished subgrade shall be prepared accurately.

When excavation is made in rock, boulders, or other unsuitable materials, the subgrade shall be made by backfilling with a minimum six-inches pipe bedding material. Any over

excavations shall be backfilled with pipe bedding material and compacted to 95% VTM-1 maximum dry density.

When installing pipe in the trench, proper implements, tools, and facilities satisfactory to the Director and as recommended by the material manufacturer shall be provided and used by the contractor for the safe and convenient prosecution of the work. Special care shall be taken to ensure that each length of pipe shall abut against the next in such manner that there shall be no shoulder or unevenness of any kind along the inside of the water main.

Pipes and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work by the Department of Utilities. The open ends of the pipelines shall be provided with carefully fitted stoppers to prevent the entrance of dirt and other foreign matter. These stoppers shall be placed in the ends of pipe lines at all times when pipe laying operations are interrupted.

All tees, bends, plugs, caps, and fire hydrants shall be substantially braced, blocked and/or anchored to prevent any movements. Restrained joints shall be used at all locations except the following:

1. Tapping sleeves and inserting tees.
2. Transit pipe.
3. Where justified by the design engineer.

Thrust restraint design shall be in accordance with DIPRA Thrust Restraint for Ductile Iron Pipe, using the following design parameters:

1. Type of pipe. For PVC, use DIP with poly encasement.
2. Pressure – design static pressure plus 120 psi surge allowance.
3. Laying condition 3.
4. Soil type – cohesive granular.
5. Safety factor – 1.5

Backing for thrust blocks shall be placed between solid, undisturbed earth and the fitting to be anchored and shall be placed so that pipe and fitting joints will be accessible for repair. Thrust blocks shall meet the requirements as shown on the Standard Details. Fitting joints and/or fitting bolts shall not be encased in concrete. Polyethylene wrapping material shall be used to protect the fittings, bolts, and nuts from being in direct contact with concrete blocking.

All pipe joints shall be assembled in accordance with AWWA C-111, C-605, and C-600.

A three-inch (3") wide blue colored water marking tape shall be buried at a distance of approximately two feet (2') below the surface and directly over all water mains to alert construction and maintenance crews that a water pipe is below. The marking tape shall be continuous.

Thrust collars shall be used where neither restrained joints nor thrust blocks are suitable due to pipe material, soil conditions, system geometry or other factors. Thrust collars shall be individually designed and detailed on the project plans for each proposed location.

A conductive tracer wire, 10 gauge copper clad steel, solid and insulated with polyvinyl chloride or equal, shall be installed with and attached to the top of all non-metallic pipes. Insulation of tracer wire installed along the main shall be stripped for one (1) inch at each fire hydrant and service line, and a separate tracer wire connected. All splices of the tracer wire and connections shall be made using approved tracer wire connectors. The tracer wire shall extend to the bottom flange under the 4 ½ inch opening of all fire hydrants or blow-offs and extend 2-3 feet above the ground and be neatly attached to the hydrant or blow-off. In addition, tracer wire shall be extended into the valve box at each fire hydrant. The tracer wire shall be installed along the service connection from the water main, where it shall be attached to the pipe, and extended into the meter barrel. A length sufficient to extend a minimum of four (4) feet above ground level shall be neatly coiled and left in place. In off-site locations, tracer wire shall be terminated in tracer wire stations. All tracer wire will be tested by the utility field representative prior to acceptance.

2.5.4 Fire Hydrant Construction

Hydrants shall be set to established grade as follows:

A. The bottom of the four and one-half (4 ½) inch nozzle shall be eighteen (18) inches above the elevation of the final grade on streets without curb and gutter and eighteen (18) inches above the elevation of the curb on streets with curb and gutter.

B. The two and one-half (2-½) inch hose connection shall have a minimum of four (4) feet clearance on all sides.

2.5.5 Road Crossings

Where roadway crossings involve roads under the jurisdiction of the Virginia Department of Transportation, all material and operations shall conform to the requirements of the Virginia Department of Transportation. The contractor shall be responsible for obtaining all permits and permissions before work is begun, and a copy of the permit shall be provided to the Utility Inspector. The Contractor shall also furnish a release from the Virginia Department of Transportation before final acceptance of the work by the County.

2.5.6 Testing

The County will supply the water used for flushing, sterilization and testing without charge. Filling of water lines may not be performed until permission has been obtained from the utility inspector. The contractor is not permitted to operate valves on any existing water line.

All new water mains and hydrant connections shall be subject to a hydrostatic pressure test after thrust restraints have been installed, the line has been backfilled, and at least seven days after the last concrete reaction anchor has been poured and all water house connections have been installed. Testing shall be in accordance with AWWA C-600. Water mains shall be filled with clean water at a velocity of approximately one foot (1') per second while necessary measures are taken to eliminate all air. A hydrostatic pressure of not less than 150 psi or 150% of normal operating pressure, whichever is greater, shall be maintained for two (2) hours. Lines of different sizes shall be tested separately. Hydrant valves shall be in the closed position. All high points in the portion of the system under test shall be vented and air shall be expelled from the system prior to beginning the test.

After the portion of the system under test has reached the required pressure as stated herein, the pressure shall be maintained for two (2) hours. At the conclusion of the pressure test, the volume of the makeup water required to refill the pipeline shall be determined by measurement with a displacement meter or by pumping from a vessel of known volume.

All leakage must be eliminated by the contractor, regardless of the amount of leakage. Should test results show displacement, damage or leakage, the contractor shall repair the displacement and damage and eliminate the leakage. He shall re-test until the specified conditions are met to the satisfaction of the Department of Utilities.

2.5.7 Disinfection

After testing and before final inspection of the completed systems, water mains shall be flushed and then chlorinated in accordance with AWWA C651. All disinfection procedures and final testing shall be carried out under the observation of a County Utility inspector. Flushing shall be accomplished at a flow velocity of not less than 3.0 feet per second. All valves, hydrants, and water house connections shall be operated during this operation. Clean water shall be flushed through the system until there is no trace of cuttings, oil, dirt, or other foreign matter flowing out of the pipe.

The disinfection concentration shall have an initial chlorine concentration of 25 mg/l per AWWA C-651. The disinfection solution shall remain in the pipeline for not less than twenty-four (24) hours, after which time a chlorine residual of 10 ppm at the extreme end of the line shall be required. The disinfection solution shall be flushed out of the pipe prior to the bacteriological samples being taken. The water remaining in the pipe after flushing shall have a total chlorine residual between 0.5- 3.0 mg/l and a free chlorine residual less than 0.5 mg/l.

Water samples for bacteriological analysis shall be taken by the Department of Utilities at regular intervals not exceeding 1,200 feet and analyzed by a certified laboratory. The sampling and testing shall then be repeated at least 16 hours later. The results of both sets of samples must indicate no coliform contamination before the pipes can be utilized. If contamination is indicated in one or both sets of samples, the entire disinfection and testing procedure must be repeated.

The contractor shall assume full responsibility for the discharge of chlorinated water during flushing. The contractor shall be responsible for any and all damages including, but not limited to, damage to vegetation, trees, streams, ponds, lakes and personal property. Further guidelines for dechlorination are explained in AWWA C651.

2.5.8 Special Consideration for Large Diameter Pipe

Water mains 18-inches (18") or larger shall be bedded in accordance with details 1.5.2-1, 1.5.2-2 and 1.5.2-3. Clay dams in general conformance to detail 3.1.2-1 shall be provided at intervals of 200-feet (200').

2.5.9 Abandoning Water Service

Water services shall be abandoned by the site contractor and work inspected by County as follows:

One-inch and smaller: Remove corporation stop and saddle, place repair clamps over opening.

Two-inch and larger: Remove nipple and replace with threaded plug or remove pipe from tee and replace with a restrained plug.

2.5.10 Fire Sprinkler System

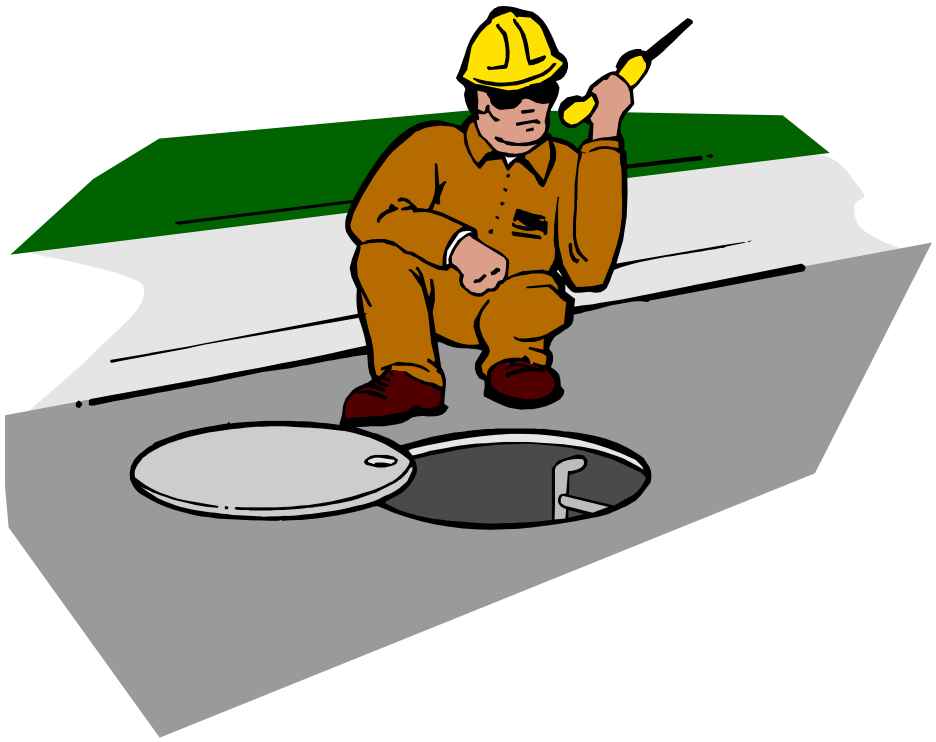
In those cases where the source of supply cannot deliver the fire flows at adequate pressures, the developer shall provide building sprinklers and fire resistive construction in accordance with Appendix B of the International Fire Code when approved by the Fire Marshal's Office.

2.5.11 Irrigation System

Where lawn irrigation systems are proposed (other than single family homes), a plan of the proposed system showing the relation with respect to water, sewer, and storm sewer must be submitted to the Department of Utilities for approval. This plan must show connection point, water meter location, pumps, backflow preventer, and system demands for meter sizing.

SECTION 3

SEWER STANDARDS



SANITARY SEWER SYSTEMS STANDARDS

3.1 GENERAL REQUIREMENTS

3.1.1 Location

In new subdivisions with curb, gutter and sidewalk, sanitary sewers shall be constructed along one of the driving lanes of the street. In all other subdivisions, the sanitary sewers shall be constructed along the shoulder of the road. Sewers in easements shall be constructed along the centerline of the easement.

When the routing of the sewer intrudes into or through private and/or public property, it shall be located so as to best serve the entire drainage area. More specifically, sanitary sewer systems must be designed and constructed along rivers, creeks, and swales where adjacent property will be served by the system. When the sanitary sewer runs parallel to a stream, the top of the sewer will be a minimum of three (3) feet, plus an allowance for slope of any future sewer crossing, below the invert of the stream channel to ensure that adequate crossings can be made. The system must terminate, at specified points in new developments, at the property line of the adjacent and/or upstream properties to be served by the system in the future. Elevation of the sewer system must be designed such that future extensions are taken into consideration to allow service to all the area that naturally drains towards the system.

Where sanitary sewers are allowed under pavements and manholes are also located in paved areas, sewer manholes will be placed at the center line of a travel lane to avoid damage to vehicles due to manhole depression.

3.1.2 Size

Wastewater collection systems shall be designed for ultimate wastewater flow within the area to be served, assuming that the entire sewer shed is developed in accordance with the current Land Use Plan.

Collecting sewers shall be a minimum of 8-inch (8") diameter and shall be designed to carry present and ultimate flows, except that sewers serving six connections or fewer on cul-de-sacs or as sidewalk collector lines may be 6 inches (6”) in diameter.

All sewers shall be sized in accordance with the Master Water and Sewer Plan and shall be designed to carry present and ultimate flows. An average daily flow of 192 gallons per day per equivalent dwelling unit shall be used. A peaking factor of 3.5 shall be used to calculate the peak hour flow, and 500 gallons per day per inch-mile of sewer shall be used to calculate groundwater influenced infiltration. Pipes six (6), eight (8), ten (10), and twelve (12) inches in diameter shall be sized at 50% of the full pipe flow. Pipes 14-inches and larger shall be sized at 85% of the full pipe flow.

3.1.3 Depth of Sewer

Generally, sewers shall be of sufficient depth to serve all existing and proposed buildings, including basements, by gravity flow, allowing for service connection grade. Greater depths may be required due to future extensions or possible lowering of existing road grade or utilities.

Sewers shall generally be installed with a minimum of four feet (4') cover below the finished street surface. Sewers with less than four feet (4') of cover below the finished street surface shall be constructed of ductile iron pipe with a concrete cradle. Sewers installed in easements with no highway traffic shall have a minimum cover of three and one-half feet (3 1/2'). Special design considerations apply when the trench load on the pipe would result in a detection of 5% or greater. PVC SDR 35 Pipe may be used for sewers less than eighteen feet (18') deep. PVC SDR 26 shall be used to depths of 25 feet. C900 DR 18 PVC shall be used for depths between 25 feet and 30 feet. Sewers with depths greater than 30 feet may not be used.

3.1.4 Hydraulic Design Criteria

Sewers shall be of the same diameter and have a uniform slope and straight alignment between manholes. Sewers shall be designed to be free flowing with the hydraulic grade 50% of the pipe diameter below the crown of the pipe for 6" to 12" diameter pipes and 15% for pipe diameters 14" and greater, and with hydraulic slopes sufficient to provide a minimum velocity of 2.25 feet per second (fps) when the sewer size selected is flowing full or half full. Pipe size shall not be arbitrarily increased in order to take advantage of a flatter grade. Velocity computations shall be based on a coefficient of roughness (n) of 0.01 as used in the Kutter or Manning formulas for PVC pipe and 0.013 for DIP and concrete.

For sewer flow depth less than one-fourth full, allowance shall be made for increased value of "n" and in no case shall velocities of less than 1.3 feet per second be permitted.

Due to low flows, upper or terminal sewer reaches, for a minimum of 300 feet, shall have a minimum slope of 0.80 percent unless there is a distinct possibility of the sewer being extended in the near future. This requirement shall not apply to high density developments, such as apartment complexes.

Sewers shall be designed such that the maximum velocity is 15 fps. Suitable drop manholes shall be provided to break steep slopes to limit the velocities in the connecting sewer pipes between manholes.

Where smaller sewers discharge into larger sewers, the 0.8D flow line of the pipes shall be matched.

In general, minimum slopes for pipe flowing 1/4 of full depth to full depth should be as follows:

Sewer Size	Minimum Slope (Ft./100 ft.)
6"	0.52

8"	0.43
10"	0.32
12"	0.25
14"	0.20
15"	0.19
16"	0.17
18"	0.15
21"	0.12
24"	0.098
27"	0.084
30"	0.073
36"	0.057

Hydraulic losses in manholes shall be accounted for by providing a minimum of 0.2 feet of difference between the invert in and the invert out for sewer lines up to and including twelve (12) inches in diameter.

3.1.5 Slope Anchorage

Concrete anchors shall be placed on sanitary sewer lines with grades of 20 percent (20%) or greater. (Anchorage shall be shown as special detail on plans.) Minimum anchorage is as follows:

A. Not over 36 feet (36') center to center on grades of 20 percent (20%) and up to thirty-five percent (35%).
B. Not over 24 feet (24') center to center on grades greater than 35 percent (>35%) and up to 50 percent (50%).
C. Not over 16 feet (16') center to center on grades greater than 50 percent (>50%).

3.1.6 Stream Crossing

The tops of all sewers crossing streams shall be at a sufficient depth below the natural bottom of the streambed to protect the sewer line. In general, one foot of suitable cover shall be provided where the stream is located in rock and three feet of suitable cover in other material. Less cover will be considered if the proposed sewer crossing is encased in concrete and will not interfere with future improvements to the stream channel. Reasons for requesting less cover shall be submitted with the construction plans. In paved channels, the top of the sewer lines should be placed below channel pavement. Sewers shall remain fully operational during the 25-year flood/wave action. Sewers and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100-year flood/wave action. Sewers located along streams shall be located outside of the streambed wherever possible and should be sufficiently removed therefrom to provide for future possible channel widening. Reasons for requesting sewer lines to be located within streambeds shall be submitted with the construction plans.

Sewers crossing streams shall be constructed of watertight pipe. The pipes and joints shall be tested in place and shall exhibit zero infiltration. Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that no other practical alternative exists. Such sewers on piers shall be constructed in accordance with the requirement for sewers crossing under streams. Construction methods and materials of construction shall be such that sewers will remain watertight and free from change in alignment or grade due to anticipated hydraulic and physical loads, erosion, and impact.

3.1.7 Depressed Sewers (Inverted Siphons)

Inverted siphons shall not be used.

3.1.8 Construction in Fill

Sanitary sewers to include sewer house laterals cannot be constructed in fill areas unless a licensed geotechnical engineer has furnished a certification that the fill has been sufficiently compacted so that settlement of the sewer or manhole will not occur. Such certification shall apply to that area directly above and below the pipe and manholes. Pressure pipes constructed on fill shall have restrained joints.

3.1.9 Protection of Water Supplies

There shall be no cross connection between a drinking water supply and a sewer, or appurtenance thereto.

3.2 MANHOLES

3.2.1 Manhole Replacements

Manholes shall be provided at all junctions with other sewers, at all points in change in alignment, grade, or pipe size, and at the terminal point of the sewer.

The maximum distance between manholes in paved areas accessible to vehicular traffic shall be four hundred (400) feet. When located in inaccessible areas, spacing of manholes shall not exceed 350 feet. The maximum depth for a manhole shall be twenty-five feet (25').

Manholes in easements shall extend above the 25-year flood level but not less than one foot above existing grade, wherever practical. Watertight manhole frames and covers shall be installed.

Manholes shall not be located in areas where water backs up in the street during a storm, such as the spread area in front of storm drainage inlets and gutter pans.

Under no circumstances shall manholes be located in sidewalks or other pedestrian travel ways. Manholes shall not be located in parking spaces.

3.2.2 Drop Manholes

At all collector system manholes, the difference between influent and effluent inverts shall not be more than twelve inches (12"). Where this difference occurs, a smooth transition between the pipes shall be provided. No connections shall be made when the difference between the influent and effluent inverts is between twelve inches (12") and twenty-four inches (24").

An inside drop manhole shall be required whenever the invert of the incoming pipe enters the manhole at an elevation greater than 24 inches (24") above the invert of the outgoing pipe. The manhole for inside drop connections must be a minimum of 5 feet (5') in diameter and one size larger than indicated in Section 3.2.8.

3.2.3 Manhole Frames and Covers

In streets, manhole frame and cover castings shall be installed so that the cover is exposed and flush with the street surface. Heavy weight lids per detail 3.2.3-1A shall be used for manholes in paved areas of major streets or as indicated on the project drawings. Thirty-six inch (36") frames and covers per detail 3.2.3-1B shall be used for manholes with sewers 24" in diameter and larger. Standard weight 24" frames and covers shall be used in all other locations. Slope adjusting rings shall be used as necessary to ensure that the cover matches the slope of the pavement. Final acceptance of sewer lines will not be made until paving is completed, all manhole covers are exposed, and the street is accepted by the Virginia Department of Transportation.

Manholes in unmaintained easements and areas subject to flooding shall have watertight manhole frames and covers installed.

All manholes shall have the manhole frame anchored to the manhole with stainless steel anchor bolts as shown on Detail 3.2.1-4.

It shall be the responsibility of the owner or developer to ensure that manhole covers are not covered or damaged due to any work being performed. All manholes shall have a positive seal between the manhole casting, adjusting rings, and cone section. An acceptable method is shown on Detail 3.2.3-8. The method of sealing shall be shown on the construction plans and is subject to the approval of the Director.

3.2.4 Manhole Connections

All manholes for service with twenty-inch (20") diameter main line pipe or smaller shall be supplied with a flexible pipe connection suitable for specified pipe and manhole. Manholes for service with main line pipes larger than twenty inches (20") shall have the first joint located four feet (4') from the inside face of the manhole.

Flexible pipe connections shall conform to ASTM C443 and ASTM 923. The construction plans shall indicate any and all bearings and/or angles of deflection for all mains connecting to manholes to ensure proper location of boot connection to manholes.

Precast manholes shall be manufactured for the specified number of connections required. Manholes with more connections than needed are not acceptable.

3.2.5 Ventilation

Ventilation of gravity sewer systems shall be provided for continuous watertight sections greater than 1,000 feet (1000') in length.

3.2.6 Flow Channel

The flow channels through manholes shall consist of precast channels of such shape and slope to provide smooth transition between inlet and outlet sewers and to reduce turbulence. The depth shall be 80% of the largest pipe diameter for changes of direction of 0º - 45º and 100% of the largest pipe diameter for changes of direction of 45º - 90º. Benches shall be sloped to the channel at two-inches (2") per foot to prevent accumulation of solids. Changes in direction of flow greater than ninety degrees (>90º), are not permitted.

3.2.7 Dog House Manholes

Doghouse manholes shall not be allowed. If a break in the sewer pipe is necessary, a new manhole must be cut into place.

3.2.8 Manhole Requirements

The minimum size manholes are required for the following changes of direction:

0° - 45°		Manhole	45° - 90°	
PVC Pipe Diameter	DI Pipe Diameter	Diameter	PVC Pipe Diameter	DI Pipe Diameter
6" – 15"	6" – 15"	48"	6"-15"	6"-15"
18" – 27"	18" – 30"	60"	18"-27"	18"-30"
N/A	48"	72"	N/A	30"
N/A	54"	84"	N/A	36"
N/A	64"	96"	N/A	42"

3.2.9 Waterproof Manhole Inserts

Waterproof manhole inserts as shown on Detail 3.2.3-3 shall be used with all non-watertight frames and covers.

3.2.10 Pipe Fittings

Vertical fittings shall be used near manholes where the slope of the influent or effluent pipes exceeds 10°.

3.2.11 Acid Resistant Manholes

For a distance of 1200 feet downstream from a force main or low pressure sewer system discharge, acid-resistant pipes and manholes shall be used. Drop manholes and manholes where excessive turbulence from sewers entering with a high velocity shall be lined with an approved acid resistant coating. On existing systems, manholes shall receive an acid-resistant coating approved by the Director. The acid resistant coating shall cover all interior concrete surfaces of the manhole, including channels, benches, and manhole sections.

3.2.12 Existing Manhole Modifications

When it becomes necessary to modify an existing manhole by making new penetrations to accommodate relocated sewer lines and/or adjusting the elevation of the manhole top, the preferred method is to replace the existing manhole with a new manhole. When it can be demonstrated to the satisfaction of the Director that the existing manhole is of modern construction and can be modified without undue risk of leaking, or that the replacement of the existing manhole is complicated by other factors, the Director may approve modification of the existing manhole provided the following steps are followed:

- The existing manhole shall be examined to determine the original manufacturer and if it was constructed with flexible manhole connectors at the pipe penetrations. If the original penetrations were grouted, and the project requires new penetrations, the manhole must be replaced.

- If it is determined that the existing manhole has flexible manhole connectors, and the proposed new lines will enter at an angle meeting the manufacturer's recommendations for adjacent penetrations, then the base may be approved for re-use. New penetration shall be made by core drilling the manhole wall and internal bench. Flow channels shall be modified to meet the requirements of paragraph 3.2.6. All core drilling shall be performed by or under the direct supervision of personnel with five years of successful experience in core drilling manholes.

- For adjustments to match revised surface elevations, new manhole sections shall be purchased with matching joint segments to ensure an accurate fit. Each manhole section shall be sealed with a O-Ring gasket, if possible, a minimum of two rows (inside and outside of joint) of butyl mastic and the exterior of the joint sealed with a six (6) inch wide band of butyl mastic sealant. The new sections shall be stable from lateral forces as well as secure from leaking.

- Following completion of the modifications, the entire manhole shall be vacuum tested for integrity in accordance with these standards and all leaks corrected regardless of whether the leaks occur in the original or the modified sections.

- Wastewater flows in the existing sewers must be addressed during vacuum testing.

3.3 SEWER SERVICES

3.3.1 Sewer House Connections

Sewer house connections shall be provided for each dwelling and lot to be served and shall be a minimum of 4 inch (4") diameter. All adjacent lots that are not a part of the proposed development, but that might be served by the sewer line shall also be provided with house connections. Only one (1) single family dwelling per lateral will be permitted. The location of each sewer house connection shall be clearly indicated on the construction drawings.

All new sewer construction shall include premanufactured wyes for sewer house connections. Saddles will only be allowed for connection to existing sewer lines. Sewer house connections to terminal manholes shall not exceed two (2) in number. Only two lateral penetrations of the manhole will be permitted. No house connections to non-terminal manholes will be allowed.

The lowest floor elevation of any structure to be served by gravity shall be a minimum of four feet (4') above the invert elevation of its sewer house connection at the sewer main. For existing structures, connection to the public sewer with plumbing fixtures located on a floor of the structure that is not four (4) feet or more above the sewer main as specified above shall not be allowed unless a written waiver is obtained from the Department or a pumping operation is utilized.

Sewer house connections shall not be tied directly into an interceptor sewer unless specifically approved by the Director.

The minimum and maximum slope for a sewer lateral shall be 2.08% and 100% respectively. The following are not permitted:

1) Attaching sewer service connections to the vertical portion of the cleanout constructed at the property line or easement line.
2) Drop connections on the portion of the lateral in the VDOT right of way or in a sanitary sewer easement.

The maximum depth of a sewer lateral at the property line or easement line shall be 12 feet and maximum length from the sewer main to property line or easement line shall be 75 feet. The utility contractor shall install a tracer wire from the main to the secondary stack in accordance with detail 2.4.5-4. For projects involving the construction of new sewer mains, the sewer lateral to the property line or easement line, the cleanout, and the secondary stack shall be constructed and tested with the sewer mains. After tentative acceptance by the county, the plumbing contractor shall construct the sewer lateral from the building to either the tested secondary stack or the tested stub beyond the primary cleanout and shall complete the primary cleanout at finished and the secondary cleanout, if applicable.

When specifically approved by the director, a longer portion of the sewer lateral beyond the long radius sweep tee and past any utility easements may be constructed with the sewer mains provided that a means of protecting the extended sewer lateral is provided. However, in no instance shall the cleanout be constructed closer to the structure than other utilities such as gas, electricity, telephone or cable TV.

A sanitary sewer lateral table shall be included in the construction plans. The table will include the inverts of the lateral at the main and elbow, the lowest floor elevations of the proposed buildings, the size, total length and length to property line or easement, and slope of the laterals, ground elevation at the property or easement line, invert at the property or easement line, and depth at the property or easement line. A sample sewer lateral schedule is included at Appendix 4.

Where laterals are constructed in areas congested with other utilities, the Director may require a profile of the sewer lateral.

3.3.2 Cleanouts

A four-inch (4") cleanout shall be provided at the property line or easement line for each house service connection. If the sewer is located beyond the property line, the cleanout shall be located at the property line. If the sewer is located in an easement on the property being served, the cleanout shall be located at the easement line. In addition, cleanouts shall be provided in accordance with the current adopted edition of the International Plumbing Code. A cast iron cleanout cover shall be placed over every cleanout, including those cleanouts installed on the sewer house connection between the property line and the building.

Lateral backwater valves shall be installed on house sewer laterals serving buildings with basements or floors located below the top of the wetwell elevation of the nearest wastewater pumping station. Condensate drains from air conditioners, furnaces and other equipment shall not be connected to waste system piping. Connection of roof downspouts, exterior foundation drains, areaway drains, basement drains and other sources of surface runoff and groundwater directly or indirectly to a sanitary sewer is prohibited by Section 25-59 of the County Code.

3.3.3 Private Sewer Connections

Sewer house connections, or portions of sewer house connections located outside of the VDOT right-of-way shall be privately owned, operated and maintained. Private sewer connections are regulated by the VUSBC.

3.4 MATERIALS

3.4.1 Ductile Iron Pipe

Ductile iron pipe shall meet requirements of AWWA C-151 (ANSI A21.5). Pipe and fittings shall have inside cement lining with an approved hydrogen sulfide protective coating. Pipe and fittings shall have an exterior bituminous coating meeting requirements of AWWA C-104 (ANSI A-21.51), double thickness.

Slip joint or mechanical joint pipe and fittings shall be used for gravity sewers in accordance with AWWA C-111 and C-153.

Class 50, 51, or 52 pipe as conditions require shall be used in all sewer applications.

Gaskets shall be furnished by the manufacturer and installed according to his recommendations.

Ductile iron pipe shall not be used for a project unless a soil investigation in accordance with AWWA C105 is performed. If the soil investigation demonstrates that the soils would be corrosive to ductile iron pipe, the pipe shall be wrapped with polyethylene in accordance with AWWA C105. Polyethylene encasement shall be in accordance with ASTM D1248 and AWWA C105 and shall be 8 mil. thick.

Ductile iron pipe may be used in general construction applications. Ductile iron pipe shall be used in exposed pipe installations, across major stream crossings, and for excessive depth of fills, where other pipe materials are subject to crushing. Where ductile iron pipe is used for a sewer main, ductile iron pipe shall be used for sewer house laterals.

3.4.2 Polyvinyl Chloride (PVC)

PVC pipe and fittings 4 inch (4") through 15 inch (15") diameter shall meet requirements of ASTM D3034, wall thickness classification SDR-35, as modified herein. PVC pipe and fittings 18 inch (18") through 48 inch (48") diameter shall meet the requirements of ASTM F679, wall thickness T-1, as modified herein. Pipe shall be furnished in lengths of not less than 12 feet. Pipe with blisters, bubbles, cuts, or scrapes on inside or outside surfaces, or imperfections which will impair the performance or life of the pipe, will be rejected.

Joints for PVC pipe and fittings shall be the integral bell gasketed joint design so, when assembled, the elastomeric gasket inside the bell is compressed radially on the pipe spigot and provides a watertight joint. Joints shall conform to ASTM D3212. The fittings shall be made from PVC components as defined and described in ASTM standard D1784. The gasket shall meet requirements of ASTM F477.

PVC pipe and fittings shall be legibly marked in accordance with ASTM D3034 and ASTM F679, and in addition marked with the date and location of manufacture. Pipe not marked as indicated herein will be rejected and pipe manufactured more than six months before the date of the work site inspection will not be accepted.

3.4.3 Manholes

Precast concrete manholes shall meet requirements of ASTM C478 except that the minimum compressive strength of the concrete shall be 5000 psi using Type II cement and a minimum compression cylinder test of 4000 psi, the variance in accordance with ASTM C478, with configurations as shown on the Standard Details and with joint gasket meeting requirements of ASTM C443. Furnish in lengths of one-foot minimum except not more than one, one-foot section shall be used in a manhole. The exterior of all manholes shall be coated with a bituminous material applied with two (2) coat application with minimum of 16 dry mils. The inside surfaces of all manholes shall be smooth. Inverts, flow channels, and benches shall be preformed by the manufacturer unless otherwise approved by the Director.

Where acid-resistant manholes are required, precast concrete manholes with an approved manhole liner shall be used. Linings shall cover all floor, wall and pipe opening surfaces, including the bottoms of flat tops, if applicable. Manhole steps shall not be installed in acid-resistant manholes.

Manhole steps shall be forged aluminum, or steel encased in corrosion resistant, non-sparking, nonconductive material of approved design. Steps shall be securely anchored to the walls of the manhole. Steps shall be uniformly spaced at 12" to 16" on center vertically and shall project evenly unless otherwise directed.

3.4.4 Manhole Frames and Covers

Grey iron castings for manhole frames and covers shall meet requirements of AASHTO M-306 and ASTM A48 Class 35B. Ductile Iron castings shall meet requirements of ASTM A536, Grade 65-45-12. Castings shall not be coated. Seating surfaces between frame and cover shall be machine ground and finished to ensure satisfactory seating and anti-rocking. Castings shall conform to the Federal Specification RR-F-6216.

Manholes, frames and covers shall be suitable for AASHTO H20/HS20 loading conditions and shall have a total weight of 320 lbs (within 5%).

Standard manhole frames with solid covers and waterproof manhole inserts shall be used in all paved areas and all maintained areas. Watertight manhole frames and covers shall be used in all other locations.

3.4.5 Valves

All valves on assemblies, such as vacuum air release assemblies shall be stainless steel, lever operated.

3.5 SEWER CONSTRUCTION

3.5.1 General Requirements

All construction of sanitary sewer mains and appurtenances in Stafford County shall be in accordance with plans and specifications approved by the Department of Utilities. Prior to the construction of the approved sanitary sewer, the design engineer or surveyor shall place adequate line and grade stakes in order that the sanitary sewer and appurtenances may be constructed in accordance with the approved plans.

The design engineer shall prepare legible cut sheets at fifty feet (50') stations indicating all pertinent construction data to include service connection locations, concrete encasement or cradle, and finish grades of manhole rims. A set of all cut sheets shall be submitted to the Department of Utilities prior to construction.

If any deviation is contemplated in the location of grade line of any sewer, structure or appurtenance from the approved plans, a revision to the plans showing the proposed deviation must be submitted to the Director for review and approval before the changes are constructed.

3.5.2 Bedding

Pipes up to and including eighteen inches (18") in diameter, except ductile iron, shall be bedded in compacted granular material. Pipe shall be placed on compacted granular bedding having a minimum thickness of one-fourth (0.25) of the pipe's outside diameter (4 inches minimum), and the granular bedding shall extend to the spring line of the pipe. Pipe bedding shall be VDOT size 57 per Section 203, Table II-3, VDOT Road and Bridge Specifications, having a maximum ½" particle size. Bedding for pipe larger than 18 inches and ductile iron pipe shall be designed on an individual basis and approved by the Director.

3.5.3 Pipe Installation

All pipe and fittings shall be carefully handled with slings or other devices to prevent damage to protective coatings or joints. Lifting equipment shall be satisfactorily rated to handle the pipe sizes used. Each section of pipe shall be thoroughly inspected for defects before being lowered into the trench. Pipe shall be laid true to line and grade with bells upstream and shall be jointed together such that the completed pipe will have a smooth invert. The standard bedding shall be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water while the work is in progress. The ends of the pipe shall be brushed so that proper joints can be made. As the work progresses, the interior of the pipe shall be cleared of dirt, cement, or other superfluous material. The exposed end of all pipe and fittings shall be fully closed to prevent earth, water, or other substances from entering the pipe. During the winter season, or during periods of inclement weather, the trench shall be completely backfilled at the end of each workday.

All sewer work shall begin at the first new downstream manhole. The sewer main construction from this point shall be installed, cleaned, tested, and accepted. Upon acceptance, the section between the existing manhole and the first new manhole shall be installed and tested. Clay dams shall be installed on each reach of sewer greater than 100-feet in length, 25-feet from the downstream manhole, in accordance with detail 3.1.2-1.

The method of making joints and the material used shall be included in the specifications and the joint material and joint testing shall conform to the latest edition of the appropriate standards and specifications. Sewer joints shall be designed to prevent infiltration and prevent the entrance of roots.

3.5.4 Service Connections

Service connection laterals from the sewer to the building shall be installed with the same care as the sewer main. Proper excavation, slope of pipe and standard granular bedding shall be provided throughout.

Service connection branches shall be plugged with a pipe stopper manufactured for such service. The stopper shall be capable of sustaining without failure or leakage, an internal pressure head of ten feet (10') (4.3 psi).

Grade for service connections shall be in accordance with VUSBC.

Service connections to terminal manholes must be tied in at the bottom of the manhole and channeled into the invert of the main. A standard drop may be used.

Lateral connections made into existing sewer mains shall be done by the use of tapping saddles.

Saddles shall be installed by cutting the pipe with a tapping machine. A rubber gasket shall be placed between the saddle and pipe. The saddle shall be secured to the pipe with a twenty-four (24) gage stainless steel strap and two (2) three-eighth inch (3/8") by three and one-eighth inch (3 1/8") by two and one-eighth inch (2 1/8") nickel-bronze T bolts.

3.5.5 Manholes

Precast concrete manholes shall consist of precast reinforced concrete sections, an eccentric conical section, and an expanded base section, extending a minimum of six inches (6") beyond the outside vertical wall (riser section) of the manhole.

The precast base section shall be installed on a compacted stabilized foundation prepared similar to that required for the proper installation of the adjacent sewer as described elsewhere in these Design Standards.

Connections to existing manholes shall be made by coring the manhole and installing a rubber boot. Flexible manhole connectors shall be installed by manufacturer-trained personnel using proper equipment, including accurate gauges.

Manhole frames shall be set in ¼" bed of an approved manhole joint sealer and anchored with stainless steel bolts in accordance with Detail 3.1.2-4.

3.5.6 Inspection and Testing

All sewer construction shall be subject to testing and inspection, including internal television inspection by the County, prior to acceptance.

The contractor shall furnish mandrels weirs, stand pipes, pipe plugs, calibrated pressure gauges, stopwatches, air compressors, hose, and such materials and assistance as required to perform these tests. All acceptance tests shall be conducted by the contractor in the presence of a utility inspector. The contractor shall schedule all acceptance tests with the Department of Utilities at least forty-eight (48) hours in advance.

Prior to the inspection by the County, the contractor shall locate and adjust all manholes, valve boxes, etc. to final grade and clean all gravity lines and manholes.

All gravity sewer lines, to include sewer house connections, shall be tested after backfill using a low-pressure air test. The air test shall be conducted as follows: provide test plugs at each manhole and securely brace. Provide suitable means of determining depth of groundwater level above the inverts immediately before testing. The testing pressure will be increased accordingly but the total pressure including the increased amount of groundwater backpressure at the springline of the pipe shall not exceed 5.5 psi. Add air slowly to the test section until the internal air pressure, as indicated on the gauge, stabilizes at 4 psi or at the increased pressure determined for the correction of the groundwater backpressure. Do not allow personnel in manholes while the test is being performed or when test section is under air pressure. If leakage is indicated at the test plugs, relieve pressure before taking steps to eliminate the leak. When the air pressure is stabilized, disconnect the hose and compressor and allow the pressure to decrease to 3.5 psi, plus correction for groundwater backpressure. Record the time period for the pressure to drop ½ psi. Pipes failing to maintain minimum holding times set forth in the table below will not be accepted.

Should the test show displacement, damage or leakage in excess of the allowable amount, the Contractor shall repair the displacement and damage and eliminate the leakage. He shall retest until the specified conditions are met to the satisfaction of the Department of Utilities.

All gravity sewer lines shall be internally inspected by closed circuit television camera by the County prior to acceptance. The contractor shall test the pipe for excessive deflection by passing a mandrel sized for 5% deflection in each pipe type, thickness, and diameter. The contractor shall repair all deficiencies noted during the inspection.

AIR TEST TABLE

Pipe Size – Diameter

Length	4”	6”	8”	10”	12”	15”	18”	21”	24”	27”
25’	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	14:25
50’	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	14:25
75’	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	14:25
100’	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	14:25
125’	1:53	2:50	3:47	4:43	5:40	7:05	8:30	10:54	14:15	18:02
150’	1:53	2:50	3:47	4:43	5:40	7:47	11:13	15:16	19:56	25:14
200’	1:53	2:50	3:47	4:43	5:42	8:54	12:49	17:27	22:48	28:51
225’	1:53	2:50	3:47	4:43	6:25	10:01	14:25	19:38	25:38	32:27
250’	1:53	2:50	3:47	4:57	7:08	11:08	16:01	21:49	28:30	36:04
275’	1:53	2:50	3:47	5:26	7:50	12:15	17:37	24:00	31:20	39:40
300’	1:53	2:50	3:48	5:56	8:33	13:21	19:14	26:11	34:11	43:16
325’	1:53	2:50	4:07	6:26	9:15	14:28	20:50	28:21	37:02	46:52
350’	1:53	2:50	4:26	6:55	9:58	15:35	22:26	30:32	39:53	50:30
375’	1:53	2:50	4:45	7:25	10:41	16:42	24:02	32:43	42:44	54:05
400’	1:53	2:51	5:04	7:54	11:24	17:48	25:38	34:54	45:35	57:42

Minimum holding time in minutes and seconds by size and length of pipe.

Pressure drop from 4.0 psi to 3.5 psi (test pressure shall be increased by amount of groundwater backpressure at springline of pipe, but shall not exceed 5.5 psi)

All manholes shall be tested for water tightness by vacuum testing after the manhole frame and cover have been installed to final grade and prior to final acceptance.

Vacuum tests shall be conducted in accordance with ASTM C1244. Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn. Vacuum equipment shall be approved by the Director prior to its use. A measured vacuum of 10 inches (10") of mercury shall be established in the manhole. The time for the vacuum to drop to nine inches (9") of mercury shall be recorded. The following are the minimum allowable test times for manhole acceptance at the specified vacuum drop:

Depth of Manhole	Time (sec) Manhole Diameter (inches)								
(feet)	30	33	36	42	48	54	60	66	72
8	11	12	14	17	20	23	25	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	48	51	57
16	22	24	29	34	40	45	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	48	55	64	72	79	89
24	33	38	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

If manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic repaired.

Manholes that fail the vacuum test shall be repaired, and the test and repairs shall be repeated until the manhole passes the test.

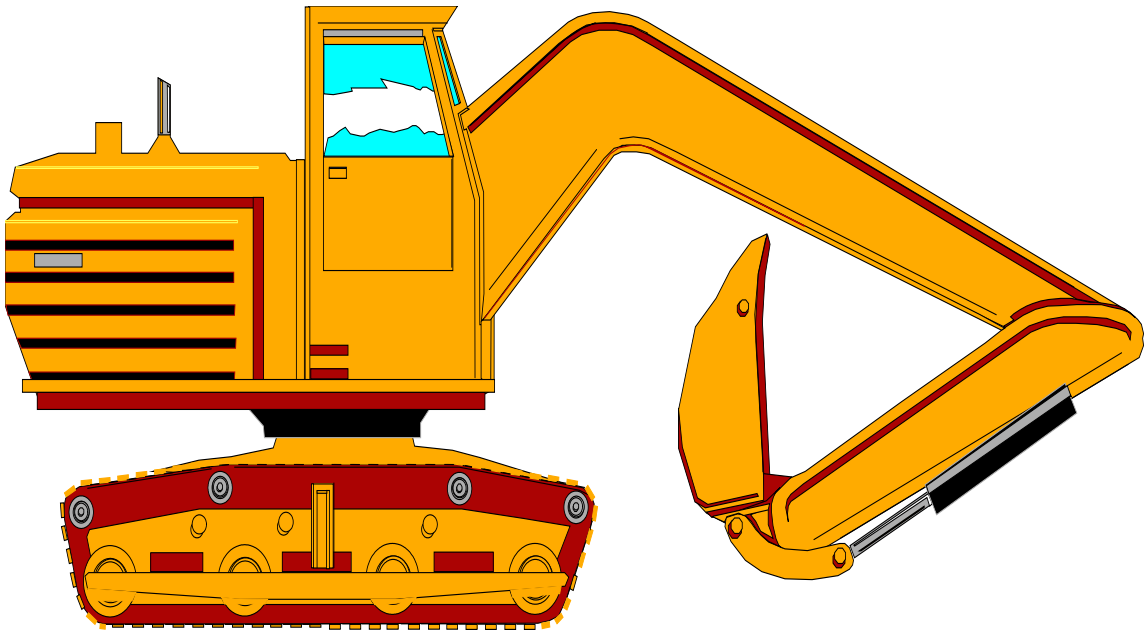
3.5.7 Abandoning Sewer Service

Sewer Services shall be abandoned by removing the tapping saddle and placing a repair clamp over the opening or by removing the 45º bend or pipe from the tee wye and replacing it with a capped stub.

All work shall be performed by site contractor and inspected by County.

SECTION 4

SEWER PUMPING STATION STANDARDS



SEWAGE PUMPING STATION STANDARDS

4.1 GENERAL

4.1.1 General Requirements

Public wastewater pumping stations will be used only when it has been determined by the Director that they are the only practical method to provide sanitary sewer service to the area and are consistent with the Water and Sewer Master Plan. Wastewater pumping stations shall comply with Virginia Sewage Collection and Treatment (SCAT) Regulations.

All wastewater-pumping stations shall be designed and specifications written by an Engineer registered in the Commonwealth of Virginia and qualified by experience to do such work. The plans and specifications shall contain sufficient detail so that no misunderstanding can arise as to the material to be used, the equipment to be installed, or the quality of the workmanship, all of which shall be of first grade quality. The plans and specifications, together with a design analysis, shall be submitted and approved by the Director and the Virginia Department of Environmental Quality (DEQ) prior to the start of any construction.

Prior to start of design, the engineer shall schedule a conference with the Department of Utilities to review the requirements of this standard and to determine specific requirements for equipment selection, and specific design details. The guidance in this chapter is general in nature. Specific design information will be provided by the Department of Utilities for each specific project.

No structures tributary to a proposed pumping station shall be occupied until the following items have been provided:

a. A "Certificate to Operate" the pumping station from the DEQ.

b. Five copies of the Operations and Maintenance Manual approved by the County and the DEQ.

Private wastewater pumping stations may be used only with approval of the Director to serve individual parcels where no other means of wastewater conveyance exists. Private wastewater pumping stations must meet the design and permitting requirements of DEQ and shall be owned and operated by the owner of the parcel they serve.

4.1.2 General Design Requirements

The design engineer shall take into consideration the appearance and landscaping of the wastewater pumping station property. The design engineer shall obtain from the County approval of a site plan meeting current requirements of the County. In particular, trees, shrubs and other landscaping shall be required to present a finished appearance consistent with the zoning and general appearance of the surrounding area.

The construction plans and plats shall identify a 100-foot zone of controlled or limited use surrounding the center of the wet well. Within such zones, residential uses or high-density human activities or activities involving food preparation shall be prohibited.

The site shall be provided with a eight-foot (8') high chain link fence with a twenty-foot (20') wide vehicle gate and a man gate. A board on board fence or other approved visual screening consistent with the general appearance of the surrounding area shall be provided.

An ample, all-weather-access twelve-foot (12') wide road, including pavement, storm drainage and parking, shall be provided for easy access to the pumping station. The access road and turn-around shall be paved outside of the fenced area of the pumping station site, as well as the entrance at a VDOT road. The grade of the road shall not exceed 10 percent. On long access roads, a locking gate will be provided at the entrance to the access road from the public right-of-way.

All pumping stations shall be designed to minimize odor and hydrogen sulfide generation; odor control facilities approved by the Department of Utilities shall be installed where required. Prevention of hydrogen sulfide generation shall be an important design consideration.

Finished floor elevations, entrance hatches and all vents shall be at least one foot (1') above the 100-year flood level.

4.1.3 Capacity Design

Wastewater pumping stations shall be sized in accordance with the criteria shown in the Master Water and Sewer Plan and shall take into consideration such parameters as minimum, average, and peak station inflows as well as minimum, average, and maximum pumping rates. The capacity of the station shall be the projected ultimate flow for the drainage basin, unless a lesser capacity is approved by the Director. In that case a phasing plan shall be submitted by the design engineer.

Pump selection and force main selection shall be based on a hydraulic analysis of the required flows, pipeline velocities, and receiving gravity sewer capacities.

Consideration must be given to designs that produce minimum power requirements to accomplish the functions required. If requested, supporting data shall be furnished to the County.

4.1.4 Power Source

All stations shall be provided with three phase 60 Hz electrical power. Devices to convert single-phase power to three-phase power will not be allowed.

All stations shall be provided with an emergency by-pass pumping arrangement and a permanently installed emergency generator with an automatic transfer switch. The transfer switch shall be sized in accordance with the electrical service requirements.

4.2 MATERIALS AND EQUIPMENT

4.2.1 Pumps

Package pumping stations shall be supplied from a manufacturer having a minimum of 5 years experience in the manufacture of pumping stations. The pumps, motors, and controls shall be supplied by a single vendor.

Pumps shall be capable of passing a minimum of three-inch (3") solids.

Wastewater pump selection should allow for upsizing and downsizing of impellers as dictated by wastewater flows.

4.2.2 Motors

The pump motors shall be submersible, close coupled with normal starting torque and low starting current. The motors shall not overload at the design condition or at any head in the operating range as specified. Motors shall be sized for both maximum and minimum head conditions as well as maximum energy efficiency. Each motor shall be in current NEMA design cast iron frame with copper windings.

4.2.3 Controls and Starters

Controls and starters shall be assembled by the control panel manufacturer in a single panel and contain the following:

a. One properly sized main circuit breaker.
b. A step-down transformer for station voltage of over 460 volts.
c. A circuit breaker and starter for the starting of each pump motor properly sized for motor running current and short circuit protection on all three phases of the motor.
d. Reduced voltage starters shall be provided for 75 HP and larger motors.
e. One control circuit to provide lead, lag, and alternate operation of pumps with provisions for hand-off-auto operation (HOA).
f. Elapsed time meters are to be provided for each pump.
g. An adjustable three phase voltage sensor to protect motors and motors starters from single phasing and under-voltage.
h. Provide for individual circuit breakers for power source for lights, ventilation fans, convenience receptacles, heater, sump pumps, and RTU receptacle as required, with step-down transformer for 120 volt A.C. to control separate circuits and station auxiliaries.
i. The panel shall be UL standard aluminum or stainless steel.
j. All panels must have point-to-point wiring.

4.2.4 Standby Power Source

All wastewater pumping stations shall be equipped with a standby power source and automatic transfer switch as follows:

a. An automatic power transfer switch and control to sense power failure and generator running and to transfer station to emergency power source.
b. A trickle charger for the generator starting battery.
c. A generator sized to permit operation of all pumps and accessories with the exception of the standby pump.

4.2.5 Flow Meter

All stations operated by variable frequency drives shall have a flow meter. The unit shall have an accuracy of plus or minus 2.0% of full scale. Meters shall be magmeter type.

4.2.6 Comminutor

At a minimum, all wastewater pumping stations will be provided with a manhole or vault upstream of the wet well for a future comminutor. The Director may require that a comminutor be included in the initial construction.

4.2.7 Telemetry System

All stations shall be provided with a remote telemetry system that is the same type and compatible with the County's existing SCADA system. The unit shall have a battery backup and a NEMA-1 enclosure (for inside locations) or NEMA 4X fiberglass enclosure (for exterior locations), and a compatible antenna.

Alarm and status inputs shall be specified by the County but as a minimum the following shall be included:

a. High water - wet well level
b. Low water-wet well level
c. Pump failure (due to overload or no-flow or over temperature or seal failure)
d. Pump run status
e. Power failure (single phase and three phase)
f. Generator run status
g. Pump flow rate
h. Intrusion alarm
i. Special points as determined by the County.

4.2.8 Wet Wells

Wet well shall be constructed of precast concrete. For waterproofing and protection against hydrogen sulfide attack, the exterior concrete surfaces shall be coated with two (2) coats of bituminous waterproofing material applied at the rate of 7 mils per dry coat or two-part epoxy with each coat being a different color. The interior surface shall have an acid-resistant high-density polyethylene acid resistant lining.

All miscellaneous metal in the wet well shall be stainless steel alloy designed for use in sewage structures. All bolts, nuts and other fasteners in wet wells shall be 316 or 304 stainless steel.

4.2.9 Valves

All valves on assemblies, such as low pressure sewer house connections shall be stainless steel, lever operated.

4.2.10 Force Mains

Force mains shall have a positive slope from the pumping station to the point of discharge unless unusual conditions make it impractical. Extra depth of bury shall be provided in lieu of air or air/vacuum relief valves wherever feasible. Every effort shall be expended to maintain the force main below the hydraulic gradient.

Pipe for sanitary sewer force mains shall meet all applicable requirements of Section 4.2.8.1 or 4.2.8.2 and shall be tested the same as water mains. A minimum cover of 3.5 feet shall be provided. Future regrading shall be taken into consideration.

A pig launching station shall be installed on the force main adjacent to the pumping station.

Gate valves shall be located on the force main adjacent to the pumping station, at intervals not to exceed 3,000 feet, and on both sides of water crossings or bridges.

All force mains shall be marked by a tracer wire in accordance with Section 2.5.4 and a three inch (3") marking tape installed two feet (2') above the pipe.

4.2.10.1 Ductile Iron Pipe

Ductile iron pipe shall meet requirements of AWWA C-151 (ANSI A21.5). Pipe and fittings shall have an inside approved ceramic epoxy coating.. Pipe and fittings shall have an exterior bituminous coating meeting requirements of AWWA C-104 (ANSI A-21.51), double thickness.

Slip joint or mechanical joint pipe and fittings shall be used for gravity sewers in accordance with AWWA C-111 and C-153.

Class 50, 51, or 52 pipe as conditions require shall be used in all sewer applications.

Gaskets shall be furnished by the manufacturer and installed according to his recommendations.

Ductile iron pipe shall not be used for a project unless a soil investigation in accordance with AWWA C105 is performed. If the soil investigation demonstrates that the soils would be corrosive to ductile iron pipe, the pipe shall be wrapped with polyethylene in accordance with AWWA C105. Polyethylene encasement shall be in accordance with ASTM D1248 and AWWA C105 and shall be 8 mil. thick.

Ductile iron pipe may be used in general construction applications. Ductile iron pipe shall be used in exposed pipe installations, across major stream crossings, and for excessive depth of fills, where other pipe materials are subject to crushing.

4.2.10.2 Polyvinyl Chloride

Polyvinyl Chloride (PVC) pipe four inches (4") through twelve inches (12") shall be minimum Pressure Class 150 (SDR 18) PVC water main with "push-on" type joints meeting all requirements of AWWA C900. PVC Pipe fourteen inches (14") through thirty-six inches (36") shall be minimum pressure class 150 (SDR 26) PVC water main with "push-on" type joints meeting all requirements of AWWA C905. Outside diameter of the PVC pipe shall be the same as the outside diameter of cast iron water pipe meeting ANSI Specifications A 21.6. Installation of force mains shall be in accordance with AWWA C605.

4.2.10.3 High Density Polyethylene

HDPE Pipe will be considered on a case-by-case basis.

4.3 LOW PRESSURE SEWER SYSTEMS

4.3.1 Introduction

Low-pressure sewer systems shall be used only when there is no reasonable way to provide gravity sewer service to the property. All grinder pumps will be owned and maintained by the property owner.

The County shall accept the maintenance responsibility for a common low pressure sewer main that serves more than one grinder pump, provided that the low pressure sewer main is installed in a public right-of-way or in a dedicated easement and built to County standards under County inspection.

4.3.2 Grinder Pump System

1. Grinder pumps accepted by the Department shall be a semi-positive displacement or centrifugal type; 15 GPM at 0 Ft. TDH; 11 GPM at 81 Ft. TDH.

2. The tank shall be 60 gallon; non-corrosive, heavy-duty, reinforced fiberglass, suitable for outdoor use; integral fiberglass access hatch included.

3. The grinder shall consist of two hardened stainless steel cutters rotating at motor speed in precision relationship to hardened alloy shredding ring to produce finely divided slurry.

4. Piping connections: Inlet for four-inch (4") lateral; discharge for one and one half inch (1 1/2") npt.

5. The minimum motor shall be 1 HP, 1725 RPM, high torque, capacitor-start, 240 volt, 60 Hertz, 8 amp, single phase; with integral, automatic reset, thermal protector.

6. The controls shall be non-fouling static sensor and pressure switch with no moving parts in contact with the wastewater; self-contained unit.

7. Two check valves shall be provided, one integral on the discharge pipe inside the tank and a second just before the building pressure sewer ties into the street pressure main. Check valves shall be full ported, non-clogging, clapper type.

8. An anti-siphon valve shall be included on the discharge pipe inside the tank.

9. Grinder pumps and control panels shall not be located inside buildings or dwellings.

10. High water level, power failure and pump alarms shall be provided. A remote panel with an alarm test function shall also be provided; as shall a remote display with audible alarm. The alarm system shall be provided with a back-up power supply. This individual alarm system for the grinder pumps will not be connected to the Department's telemetry system.

11. An electrical permit issued by the County's Department of Public Works is required.

12. The control console alarm system shall be located in an accessible and visible location as close to the grinder pump as possible.

13. A disconnect shall be provided adjacent to the pump per NEC code. The pump controls will be located in the top housing of the core unit inside a waterproof access cover. They may also be located adjacent to the disconnect, in a NEMA 4 box.

14. A transfer switch shall be provided so that the grinder pump can be powered by a generator during a prolonged power outage. The County will not provide such generators.

15. All electrical equipment must be UL listed.

16. All equipment must be tested in accordance with the NEC.

17. Battery or generator standby power supply sufficient for 2 hours of intermittent pump operation.

4.3.3 Low Pressure Sewer Mains

1. The low pressure sewer main shall be class SDR 21 PVC pipe or SDR 17 HDPE. The low pressure sewer main shall be marked by tracer wire in accordance with section 2.5.4.

2. Schedule 40 solvent welded joints shall be made in accordance with the manufacturers' recommendations and in accordance with ASTM D 1885.

3. SDR 21 pipe shall have gasket joints in accordance with ASTM 1869.

4. Thrust blocks shall be provided for gasket type piping at all bends, tees, and changes of direction.

5. Force main piping shall be tested at 60 PSI for 30 minutes. No leakage shall be permitted.

6. Flushing connections shall be provided at the beginning of each force main line, at major changes of direction, and approximately every 600 to 1000 linear feet in accordance with Details 4.3.1-1 and 4.3.1-2.

7. Pressure sewer laterals from individual grinder pumps shall be connected to a common low pressure sewer main using a low pressure sewer house connection in accordance with Detail 4.3.1-3.

8. A valve shall be provided at each change in pipe size.

4.4 VACUUM SEWER SYSTEMS

Vacuum sewer systems shall NOT be used.

SECTION 5

STANDARD DETAILS

STANDARD DETAILS

5.1 GENERAL DETAILS

Buttresses for 11-¼° Horizontal Bend	1.4.1-1	12/04
Buttresses for 22-½° Horizontal Bend	1.4.1-2	12/04
Buttresses for 45° Horizontal Bend	1.4.1-3	12/04
Buttresses for 90° Horizontal Bend	1.4.1-4	12/04
Buttresses for Tees, Plugs, & Caps	1.4.1-5	12/04
Anchorage for 11 ¼°, 22 ½°, & 45° Upper Vertical Bends	1.4.1-6	12/04
Buttress for 11 ¼°, 22 ½° & 45° Lower Vertical Bends	1.4.1-7	12/04
Restrained Lengths for Horizontal Bends, Dead Ends & Valves	1.4.1-8	12/04
Restrained Lengths for 11 ¼°, 22 ½°, & 45° Upper Vert. Bends	1.4.1-9	12/04
Restrained Lengths for 11 ¼°, 22 ½°, & 45° Lower Vert. Bends	1.4.1-10	12/04
Restrained Lengths for Tees, Run Diameters 6" to 12"	1.4.1-11A	12/04
Restrained Lengths for Tees, Run Diameters 14" to 20"	1.4.1-11B	12/04
Restrained Lengths for Tees, Run Diameters 20" to 30"	1.4.1-11C	12/04
Restrained Lengths for Reducers	1.4.1-12	12/04
Standard Concrete Cradle & Encasement	1.4.2-1	12/04
Steel Casing Detail for PVC or DIP	1.4.2-2A	03/06
Steel Casing Detail for HDPE	1.4.2-2B	03/06
Concrete Collar for Steep Slopes	1.4.2-3	02/17
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Trench for Waterlines and Force Mains in non-paved Areas	1.5.2-2	09/16
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Trench for Sewers in Shoulder of Road	1.5.2-4	10/15
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Trench for Sewers Beneath Pavement	1.5.2-6	10/15
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Standard Stream Crossing	1.5.3-1	12/04

5.2 WATER DETAILS

Water Service Connection Detail	2.2.1-1	12/04
Water Meter Setting – ⅝", ¾", 1" Meters	2.2.2-1	07/16
Traffic Rated Water Meter Frame & Cover	2.2.2-3	07/16
Water Meter Setting up to and Including 2" Meter Connections	2.2.2-4	09/16
Water Meter Setting – 3" and Larger Meters	2.2.2-5	12/04
Exterior Backflow Prevention Device	2.2.2-6	12/04
Interior RPZ Device Installation	2.2.2-7	12/04
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Double Check Assembly and Vault – 4" & Larger	2.2.3-1	12/04
Vacuum Air Release or Air Release 2" and Smaller Off Pipe Location Dry Locations	2.3.1-1	11/16
Vacuum Air Release or Air Release 2" and Smaller Off Pipe Location Dry Locations	2.3.1-2	11/16
Vacuum Air Release or Air Release 2" and Smaller Off Pipe Location for Wet Locations	2.3.1-3	10/16
Direct Bury Vacuum-Air Release Valve Off-Pipe Installation for Wet Locations	2.3.1-4	09/16
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5.3 SEWER DETAILS

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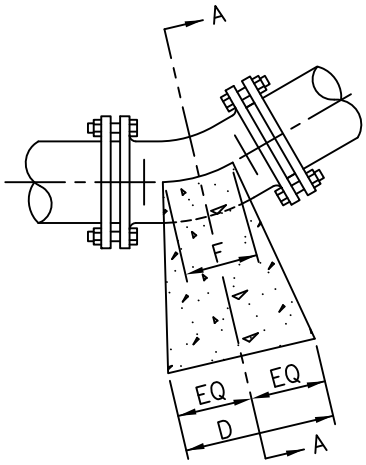
Typical 5' and 6' and 8' I.D. Precast Manhole W/4" Stack	3.2.1-2	10/16
Typical 5' & 6' ID Precast Concrete Manhole w/ Flat Top	3.2.1-2A	10/16
Typical 8' ID Precast Concrete Manhole w/ 4' Stack	3.2.1-2B	10/16
Precast Concrete Manhole Flat Top	3.2.1-3	12/04
Manhole Anchor Bolt	3.2.1-4	12/04
Access Chamber	3.2.1-5	12/04
Typical 5' Manhole With Inside Drop Connection	3.2.2-1	09/16
Standard Manhole Frame & Cover	3.2.3-1	10/16
Heavy Weight Traffic Standard Frame & Cover	3.2.3-1A	07/16
36-Inch Frame and Cover	3.2.3-1B	10/15
Watertight Manhole Standard Weight Frame & Cover	3.2.3-2	07/16
Waterproof Manhole Insert	3.2.3-3	09/16
Internal Manhole Chimney Seal	3.2.3-8	10/16
Manhole Vent	3.2.5-1	03/06
4-Inch Sewer House Connection	3.3.3-1A	09/16
6-Inch Sewer House Connection	3.3.3-1B	09/16
Low Pressure House Service Connection to Gravity Sewer	3.3.3-2	12/04
Cleanout Cover Assembly for 4" Cleanouts in Areas Subject to Vehicle Traffic	3.3.3-3A	04/10
Cleanout Cover Assembly for 4" Cleanouts at Easements and Property Lines	3.3.3-3B	04/10
Panella-Type Cleanout Cap Assembly for 4" Cleanouts in Interior Yard Areas	3.3.3-3C	04/10
Sewer House Tap for Existing Main	3.3.3-4	10/16
Tracer Wire for Sewer Laterals	3.3.3-5	09/16

5.4 PUMPING STATION DETAILS

Sewage Combination Air/Vacuum Valve	4.2.5-1	12/04
Sewage Combination Air/Vacuum Short Pattern Valve	4.2.5-2	12/04
Inline Flushing Connection - LPSS	4.3.1-1	10/16
Terminal Connection - LPSS	4.3.1-2	10/16
Low Pressure Sewer House Connection	4.3.1-3	01/16
Force Main Connection to Gravity Sewer	4.4.1-1	12/04



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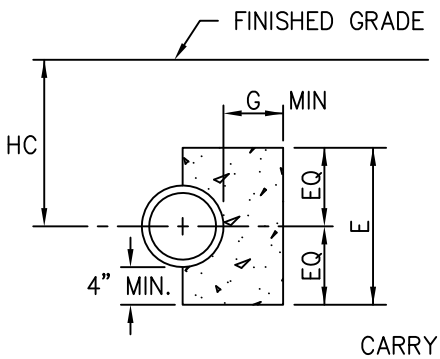


SECTION A–A

CARRY CONCRETE TO UNDISTURBED EARTH OR FIRM SUBGRADE

SOIL PROPERTIES	SIZE	Concrete Block Dimensions At 150 PSI Pressure				Add To Dimension D For Each Add 50 PSI Pressure Up To 300 PSI	Adjustment For Conc. Area For Different Height HC To Be Measured From Grade to ℄ Of Pipe			
		D	E	F	G		Up To 8'	8'–1" To 12'	12'–1" To 16'	16'–1" To 20'
CS = 1000 PSF ϕ = 15° SOFT SILTY CLAY & BETTER	3"	4"	1'	4"	6"	2"	CONC. BLOCK AREA 1.0 X D X E	CONC. BLOCK AREA 0.875 X D X E	CONC. BLOCK AREA 0.75 X D X E	CONC. BLOCK AREA 0.625 X D X E
	4"	4"	1'	4"	6"	2"				
	6"	6"	1'–2"	6"	7"	2"				
	8"	8"	1'–4"	8"	7"	2"				
	10"	9"	1'–6"	8"	8"	4"				
	12"	1'	1'–8"	1'	9"	4"				
	16"	1'–3"	2'	1'	9"	6"				
	20"	1'–3"	2'–6"	1'	10"	6"				
	24"	1'–6"	3'	1'	1'	6"				
	30"	2'	3'–6"	1'–4"	1'–2"	9"				
CS = 0 ϕ = 15° LOOSE SILTY SAND	3"	10"	1'–6"	6"	9"	2"	CONC. BLOCK AREA 1.0 X D X E	CONC. BLOCK AREA 0.5 X D X E	CONC. BLOCK AREA 0.375 X D X E	CONC. BLOCK AREA 0.25 X D X E
	4"	1'	2'	6"	9"	2"				
	6"	1'–6"	2'	6"	1'	2"				
	8"	2'–4"	2'	8"	1'	2"				
	10"	2'–6"	2'–3"	8"	1'	4"				
	12"	3'–4"	2'–6"	1'	1'	4"				
	16"	4'–2"	3'	1'	1'–6"	6"				
	20"	4'–6"	3'–6"	1'	1'–6"	6"				
	24"	5'–8"	4'	1'–6"	1'–6"	6"				
	30"	7'	5'	2'	1'–6"	9"				

1) DIMENSION D & E SHALL BE ADJUSTED FOR REQUIRED AREA.
2) DIMENSION F & G SHALL REMAIN SAME.
3) DIMENSION D SHALL BE ADJUSTED FOR REQUIRED PRESSURE IN EXCESS OF 150 PSI BEFORE MAKING ADJUSTMENT FOR HEIGHT.
4) THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE DEPARTMENT OF UTILITIES.

DECEMBER 2004

1.4.1–1

STAFFORD COUNTY DEPARTMENT OF UTILITIES

BUTTRESSES FOR 11 1/4° HORIZONTAL BEND

SOIL PROPERTIES	SIZE	CONCRETE BLOCK DIMENSIONS AT 150 PSI PRESSURE				ADD TO DIMENSION D FOR EACH ADD 50 PSI PRESSURE UP TO 300 PSI	Adjustment For Conc. Area For Different Height HC To Be Measured From Grade to ℄ Of Pipe			
		D	E	F	G		Up To 8'	8'–1" To 12'	12'–1" To 16'	16'–1" To 20'
CS = 1000 PSF ϕ = 15° SOFT SILTY CLAY OR BETTER	3"	6"	1'–0"	6"	7"	2"	CONC. BLOCK AREA = 1.0 X D X E	CONC. BLOCK AREA = 0.875 X D X E	CONC. BLOCK AREA = 0.75 X D X E	CONC. BLOCK AREA = 0.625 X D X E
	4"	6"	1'–0"	6"	7"	2"				
	6"	8"	1'–2"	6"	8"	2"				
	8"	1'–0"	1'–4"	8"	8"	4"				
	10"	1'–3"	1'–6"	8"	10"	4"				
	12"	1'–6"	1'–8"	1'–0"	1'–0"	6"				
	16"	2'–0"	2'–0"	1'–0"	1'–3"	6"				
	20"	2'–6"	2'–6"	1'–0"	1'–6"	9"				
	24"	3'–0"	3'–0"	1'–0"	1'–6"	9"				
	30"	4'–0"	3'–6"	1'–4"	1'–9"	1'–0"				
CS = 0 ϕ = 15° LOOSE SILTY SAND	3"	1'–0"	1'–6"	6"	9"	2"	CONC. BLOCK AREA = 1.0 X D X E	CONC. BLOCK AREA = 0.5 X D X E	CONC. BLOCK AREA = 0.375 X D X E	CONC. BLOCK AREA = 0.25 X D X E
	4"	1'–6"	2'–0"	6"	9"	2"				
	6"	2'–0"	2'–0"	6"	1'–0"	2"				
	8"	3'–4"	2'–0"	8"	1'–0"	4"				
	10"	4'–2"	2'–3"	8"	1'–0"	4"				
	12"	4'–8"	2'–9"	1'–0"	1'–6"	6"				
	16"	5'–9"	3'–6"	1'–0"	1'–6"	6"				
	20"	7'–10"	4'–0"	1'–0"	2'–0"	9"				
	24"	9'–10"	5'–0"	1'–6"	2'–0"	9"				
	30"	11'–8"	6'–0"	2'–0"	2'–0"	1'–0"				

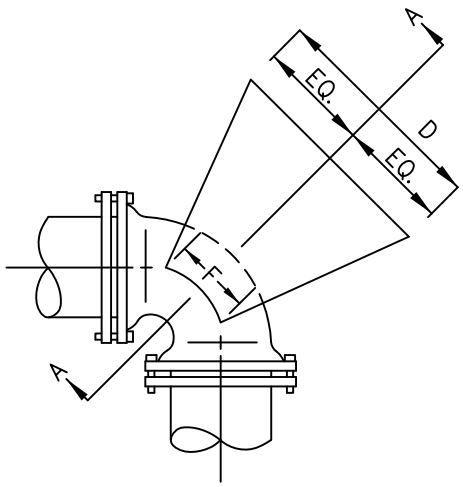
DIMENSION D & E SHALL BE ADJUSTED FOR REQUIRED AREA.
DIMENSION F & G SHALL REMAIN SAME.
DIMENSION D SHALL BE ADJUSTED FOR REQUIRED PRESSURE IN EXCESS OF 150 PSI BEFORE MAKING ADJUSTMENT FOR HEIGHT.

NOTES:

1. FC = 3000 PSI AT 28 DAYS.
2. CS = SOIL COHESION IN PSF AND ϕ = ANGLE OF INTERNAL FRICTION.
3. CARRY ALL BEARING SURFACES TO UNDISTURBED GROUND OR FIRM SUBGRADE.
4. THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE DEPARTMENT OF UTILITIES.

SOIL PROPERTIES	SIZE	Concrete Block Dimensions At 150 PSI Pressure				Add To Dimension D For Each Add 50 PSI Pressure Up To 300 PSI	Adjustment For Conc. Area For Different Height HC To Be Measured From Grade to ℄ Of Pipe			
		D	E	F	G		Up To 8'	8'–1" To 12'	12'–1" To 16'	16'–1" To 20'
CS = 1000 PSF ϕ = 15° SOFT SILTY CLAY OR BETTER	3"	9"	1'–0"	6"	6"	4"	CONC. BLOCK AREA 1.0 X D X E	CONC. BLOCK AREA 0.875 X D X E	CONC. BLOCK AREA 0.75 X D X E	CONC. BLOCK AREA 0.625 X D X E
	4"	9"	1'–0"	6"	6"	4"				
	6"	1'–0"	1'–2"	6"	8"	4"				
	8"	1'–6"	1'–4"	8"	9"	6"				
	10"	2'–0"	1'–6"	8"	10"	6"				
	12"	2'–6"	1'–8"	1'–0"	1'–0"	9"				
	16"	3'–6"	2'–6"	1'–0"	1'–3"	9"				
	20"	4'–8"	2'–6"	1'–0"	1'–4"	1'–4"				
	24"	5'–0"	3'–0"	1'–0"	1'–9"	2'–0"				
	30"	6'–0"	4'–0"	1'–4"	2'–3"	2'–0"				
CS = 0 ϕ = 15° LOOSE SILTY SAND	3"	1'–6"	1'–6"	6"	1'–0"	4"	CONC. BLOCK AREA 1.0 X D X E	CONC. BLOCK AREA 0.5 X D X E	CONC. BLOCK AREA 0.375 X D X E	CONC. BLOCK AREA 0.25 X D X E
	4"	2'–0"	2'–0"	6"	1'–0"	4"				
	6"	3'–0"	2'–0"	6"	1'–0"	4"				
	8"	4'–0"	2'–6"	8"	1'–0"	6"				
	10"	6'–0"	2'–6"	8"	1'–0"	6"				
	12"	7'–0"	3'–0"	1'–0"	1'–6"	9"				
	16"	11'–0"	4'–0"	1'–0"	1'–6"	9"				
	20"	11'–8"	5'–0"	1'–0"	2'–0"	1'–4"				
	24"	12'–6"	6'–0"	1'–6"	2'–0"	2'–0"				
	30"	20'–0"	6'–0"	2'–0"	2'–6"	2'–0"				

1) DIMENSION D & E SHALL BE ADJUSTED FOR REQUIRED AREA.
2) DIMENSION F & G SHALL REMAIN SAME.
3) DIMENSION D SHALL BE ADJUSTED FOR REQUIRED PRESSURE IN EXCESS OF 150 PSI BEFORE MAKING ADJUSTMENT FOR HEIGHT.
4) THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE DEPARTMENT OF UTILITIES.



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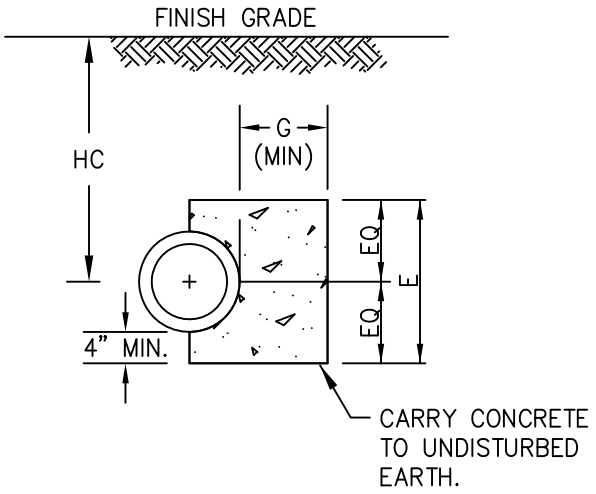


SECTION A–A

SIZE	Concrete Block Dimensions At 150 PSI Pressure				Add to Dimension "D" For Each Add'l 50 PSI Pressure Up To 300 PSI	Adjustment for Conc. Area For Different Height (HC) To Be Measured From Grade To C of Pipe			
	D	E	F	G		Up To 8'–0"	8'–1" To 12'	12'–1" To 16'	16'–1" To 20'
3"	2'–6"	2'–0"	8"	1'–0"	6"	CONC. BLOCK AREA 1.0 X D X E	C. B. A. 0.5 X D X E	C. B. A. 0.375 X D X E	C. B. A. 0.25 X D X E
4"	3'–4"	2'–0"	8"	1'–0"	6"				
6"	5'–2"	2'–0"	1'–0"	1'–6"	6"				
8"	6'–8"	2'–6"	1'–0"	1'–6"	9"				
10"	10'–0"	3'–0"	1'–6"	1'–6"	9"				
12"	10'–0"	4'–0"	1'–6"	2'–0"	1'–0"				
16"	12'–6"	5'–0"	2'–0"	2'–0"	1'–0"				
20"	15'–10"	6'–0"	2'–0"	2'–0"	2'–0"				

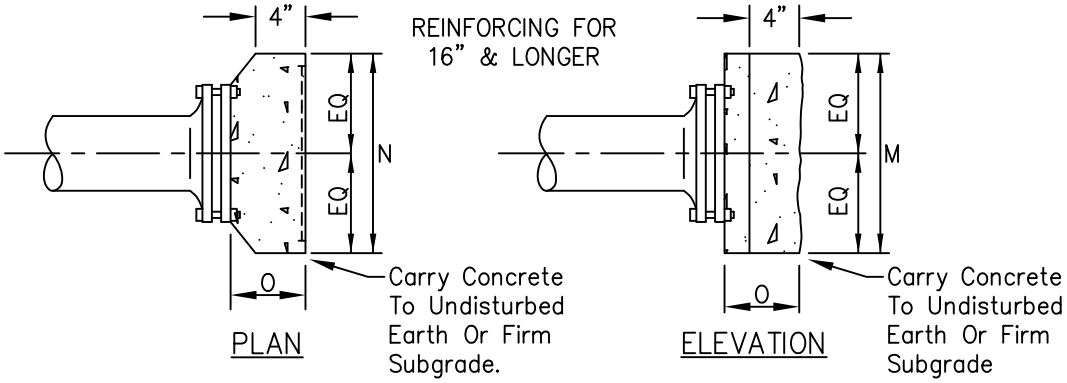
1) DIMENSION D & E SHALL BE ADJUSTED FOR REQUIRED AREA.
2) DIMENSION F & G SHALL REMAIN SAME.
3) DIMENSION D SHALL BE ADJUSTED FOR REQUIRED PRESSURE IN EXCESS OF 150 PSI BEFORE MAKING ADJUSTMENT FOR HEIGHT.
4) THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE DEPARTMENT OF UTILITIES.
5) SPECIAL DESIGN REQUIRED FOR LINES 24" IN DIAMETER OR GREATER.

DECEMBER 2004

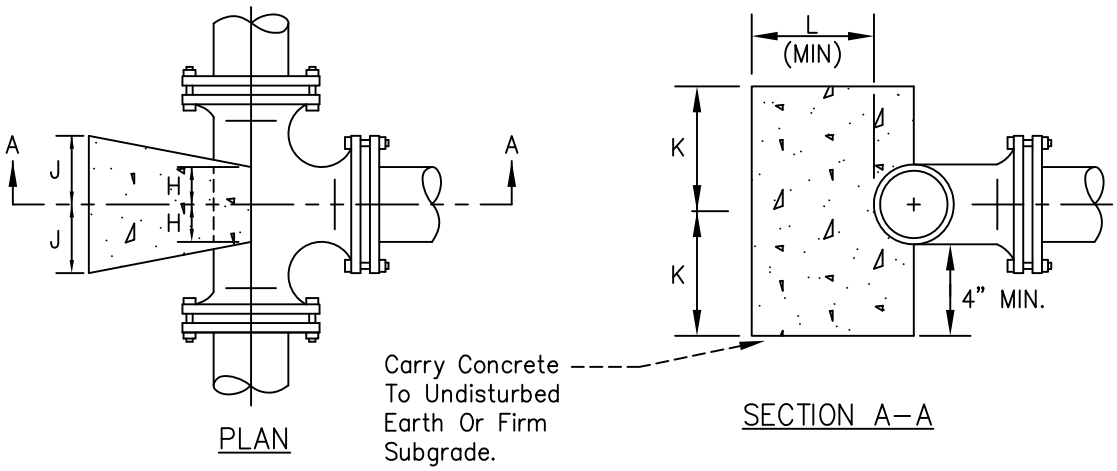
1.4.1–4

STAFFORD COUNTY DEPARTMENT OF UTILITIES

BUTTRESSES FOR 90° HORIZONTAL BEND



BUTTRESS FOR PLUGS & CAPS										
	SIZE									
	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
M	*	*	*	2'-6"	2'-8"	3'-6"	4'-8"	6'-0"	6'-8"	8'-0"
N	*	*	*	1'-6"	2'-2"	2'-6"	3'-4"	4'-0"	5'-0"	6'-8"
O	*	*	*	10"	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	2'-0"
							REINFORCE WITH 66" EW			



BUTTRESS FOR TEES										
	SIZE OF BRANCH									
	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
J	6"	6"	8"	9"	1'-1"	1'-3"	1'-8"	2'-0"	2'-6"	3'-4"
K	6"	8"	10"	1'-3"	1'-4"	1'-9"	2'-4"	3'-0"	3'-4"	4'-0"
L	6"	6"	8"	9"	10"	12"	1'-2"	1'-6"	1'-8"	2'-0"
H	4"	4"	6"	6"	6"	6"	8"	1'-0"	1'-0"	1'-0"

AREA OF BLOCK = 2J X 2K

NOTE: TAPPING ASSEMBLIES & SLEEVES TO BE CONCRETE BLOCKED AS COMPARABLE SIZED TEES

NOTES:

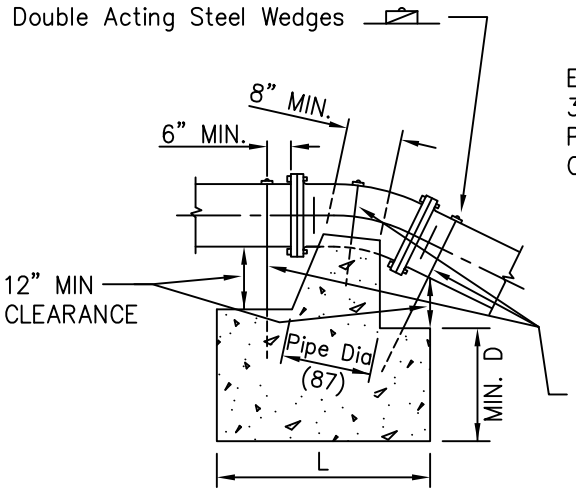
1. Fc = 3000 PSI AT 28 DAYS.
2. THE BUTTRESS DIMENSIONS ARE BASED ON THE WATER PRESSURE OF 150 PSI WHERE THE PRESSURE IS DIFFERENT, THE AREA OF BLOCK SHALL BE PROPORTIONED TO REQUIRED PRESSURE
3. CARRY ALL BEARING SURFACES TO UNDISTURBED GROUND OR FIRM SUBGRADE
4. THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE UTILITY DEPARTMENT.

DECEMBER 2004

1.4.1-5

STAFFORD COUNTY DEPARTMENT OF UTILITIES

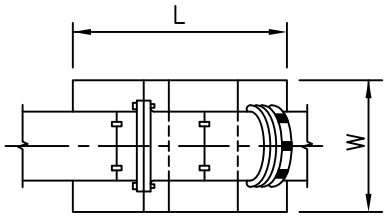
BUTTRESSES FOR TEES, PLUGS & CAPS



ELEVATION

Embed Reinforcing Bars Minimum 36" Diameters Including The Hook Paint Exposed Bars With Two Coats Of Bituminous Paint.

Reinforcing Bars Where 4 Reinforcing Bars Used, Place 2 Symmetrically Placed Reinf Bars At Bends And Other 2 Bars As Shown In Detail.



PLAN

BEND		SIZE									
		3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
11 1/4°	L	1'–6"	1'–6"	2'–0"	2'–0"	2'–3"	2'–6"	3'–3"	4'–0"	4'–6"	5'–0"
	W	1'–6"	1'–6"	2'–0"	2'–0"	2'–3"	2'–6"	3'–3"	4'–0"	4'–6"	5'–0"
	D	1'–6"	1'–6"	1'–6"	2'–0"	2'–0"	2'–3"	2'–6"	2'–6"	3'–0"	3'–0"
	Reinf Bars No & Size	3 #5	3 #5	3 #5	3 #6	3 #6	3 #6	3 #6	3 #8	3 #8	3 #8
22 1/2°	L	1'–6"	2'–0"	2'–6"	2'–9"	3'–6"	4'–0"	4'–6"	5'–6"	6'–0"	7'–0"
	W	1'–6"	2'–0"	2'–6"	2'–9"	3'–6"	4'–0"	4'–6"	5'–6"	6'–0"	7'–0"
	D	1'–6"	1'–6"	2'–0"	2'–3"	2'–3"	2'–6"	3'–0"	3'–6"	4'–0"	4'–6"
	Reinf Bars No & Size	3 #5	3 #5	3 #5	3 #6	3 #6	4 #6	4 #6	3 #8	4 #8	4 #8
45°	L	2'–0"	2'–6"	3'–0"	3'–6"	4'–0"	4'–6"	6'–0"	7'–6"	8'–6"	10'–0"
	W	2'–0"	2'–6"	3'–0"	3'–6"	4'–0"	4'–6"	6'–0"	7'–6"	8'–6"	10'–0"
	D	1'–6"	2'–0"	2'–0"	2'–6"	2'–9"	3'–0"	3'–6"	4'–0"	4'–6"	5'–0"
	Reinf Bars No & Size	3 #5	3 #5	3 #5	3 #6	4 #6	4 #6	4 #8	4 #8	4 #8	4 #9

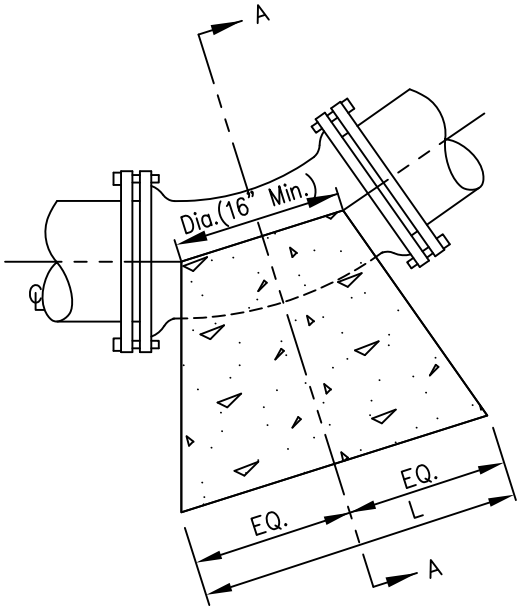
NOTES:
1. Fc=3000 PSI AT 28 DAYS.
2. Carry All Bearing Surfaces To Undisturbed Earth Or Firm Subgrade.
3. The Anchorage Dimensions Are Based On The Water Pressure Of 150 PSI. Where The Pressure Is Different, The Volume Of The Concrete (I.E. L x W x D) Shall Be Proportioned To Required Pressure.
4. Thrust Blocks Shall Be Installed Only Where Approved By The Department Of Utilities.

DECEMBER 2004

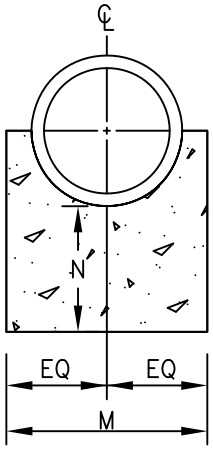
1.4.1–6

STAFFORD COUNTY DEPARTMENT OF UTILITIES

ANCHORAGE FOR 11 1/4°, 22 1/2° & 45° UPPER VERT. BENDS



ELEVATION

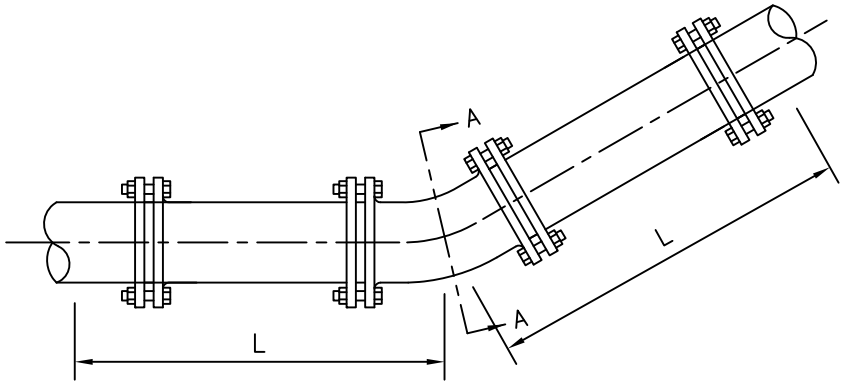


SECTION

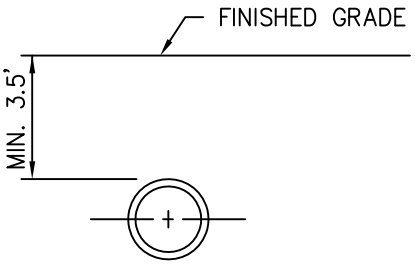
BUTTRESS FOR LOWER VERTICAL BENDS											
BEND		SIZE									
		3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
11–1/4°	L	6"	6"	6"	8"	8"	8"	1'–1"	1'–5"	1'–10"	2'–8"
	M	1'–0"	1'–0"	1'–2"	1'–4"	1'–6"	2'–0"	2'–4"	2'–8"	3'–0"	3'–4"
	N	8"	8"	8"	8"	8"	8"	9"	10"	12"	1'–2"
22–1/2°	L	6"	6"	10"	11"	1'–3"	1'–4"	2'–1"	2'–9"	3'–7"	3'–3"
	M	1'–0"	1'–0"	1'–2"	1'–4"	1'–6"	2'–0"	2'–4"	2'–8"	3'–0"	3'–2"
	N	8"	8"	8"	8"	9"	9"	12"	1'–2"	1'–4"	1'–6"
45°	L	10"	1'–0"	1'–2"	1'–9"	2'–5"	2'–8"	4'–0"	5'–6"	6'–0"	8'–2"
	M	1'–0"	1'–0"	1'–2"	1'–4"	1'–6"	2'–0"	2'–4"	2'–8"	3'–6"	4'–0"
	N	8"	8"	8"	8"	12"	1'–2"	1'–6"	2'–0"	2'–6"	3'–0"

NOTES:

1. Fc = 3000 PSI AT 28 DAYS.
2. CARRY ALL BEARING SURFACES TO UNDISTURBED EARTH OR FIRM SUBGRADE.
3. THE BUTTRESS DIMENSIONS ARE BASED ON THE WATER PRESSURE OF 150 PSI AND SOIL BEARING PRESSURE OF 2500 PSI. WHERE THE WATER PRESSURE AND SOIL BEARING PRESSURE ARE DIFFERENT, THE AREA OF CONCRETE BLOCK (I.E. L & M) SHALL BE PROPORTIONED ACCORDINGLY. AREA ADJUSTMENT FOR REQUIRED PRESSURE SHALL BE MADE FIRST BEFORE MAKING ADJUSTMENT FOR SOIL BEARING PRESSURE.
4. THRUST BLOCKS SHALL BE INSTALLED ONLY WHERE APPROVED BY THE DEPARTMENT OF UTILITIES.



PLAN

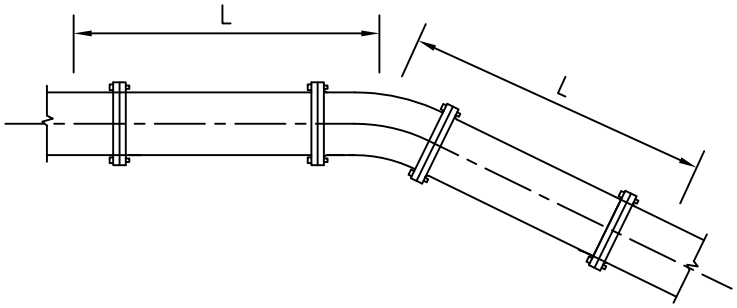


SECTION A–A

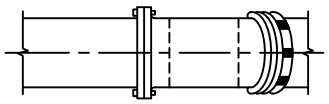
L : RESTRAINED LENGTHS FOR PVC AND POLYWRAPPED PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° HORIZ. BEND	2'	3'	4'	5'	6'	7'	9'	10'	11'	12'	15'
22 1/2° HORIZ. BEND	4'	5'	7'	10'	12'	14'	18'	20'	21'	25'	30'
45° HORIZ. BEND	9'	11'	15'	20'	24'	28'	37'	41'	45'	52'	63'
90° HORIZ. BEND	22'	26'	37'	48'	58'	69'	89'	98'	108'	126'	152'
DEAD ENDS & VALVES	43'	52'	75'	98'	119'	141'	184'	205'	225'	267'	326'

L : RESTRAINED LENGTHS FOR BARE DUCTILE IRON PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° HORIZ. BEND	2'	2'	3'	4'	6'	6'	8'	8'	9'	11'	13'
22 1/2° HORIZ. BEND	4'	5'	6'	8'	10'	12'	15'	17'	19'	22'	26'
45° HORIZ. BEND	8'	9'	13'	17'	21'	25'	32'	36'	39'	46'	55'
90° HORIZ. BEND	19'	23'	32'	42'	51'	60'	77'	86'	94'	110'	133'
DEAD ENDS & VALVES	30'	37'	52'	68'	83'	99'	129'	143'	158'	187'	228'

1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.



ELEVATION

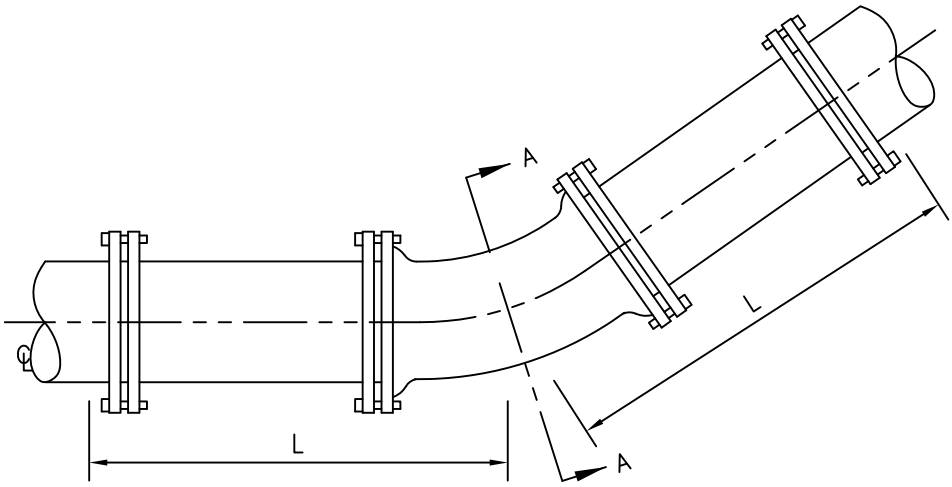


PLAN

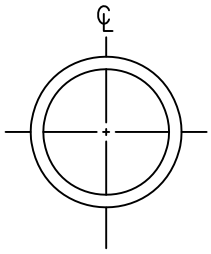
L : RESTRAINED LENGTHS FOR PVC AND POLYWRAPPED PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° UPPER VERT. BEND	2'	3'	4'	5'	6'	7'	9'	10'	11'	12'	15'
22 1/2° UPPER VERT. BEND	4'	5'	7'	10'	12'	14'	18'	20'	21'	25'	30'
45° UPPER VERT. BEND	9'	11'	15'	20'	24'	28'	37'	41'	45'	52'	63'

L : RESTRAINED LENGTHS FOR BARE DUCTILE IRON PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° UPPER VERT. BEND	2'	2'	3'	4'	5'	6'	8'	8'	9'	11'	13'
22 1/2° UPPER VERT. BEND	4'	5'	6'	8'	10'	12'	15'	17'	19'	22'	26'
45° UPPER VERT. BEND	8'	9'	13'	17'	21'	25'	32'	36'	39'	46'	55'

1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.



ELEVATION



SECTION

L : RESTRAINED LENGTHS FOR PVC AND POLYWRAPPED PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° LOWER VERT. BEND	6'	7'	11'	14'	17'	20'	26'	29'	32'	37'	45'
22 1/2° LOWER VERT. BEND	12'	15'	22'	28'	34'	40'	52'	58'	64'	75'	91'
45° LOWER VERT. BEND	26'	31'	45'	58'	71'	84'	108'	121'	133'	156'	190'

L : RESTRAINED LENGTHS FOR BARE DUCTILE IRON PIPES (FEET)											
DIAMETER OF PIPE	3"	4"	6"	8"	10"	12"	16"	18"	20"	24"	30"
11 1/4° LOWER VERT. BEND	4'	5'	7'	10'	12'	14'	18'	20'	22'	26'	32'
22 1/2° LOWER VERT. BEND	9'	11'	15'	20'	24'	28'	36'	41'	45'	53'	64'
45° LOWER VERT. BEND	18'	22'	31'	41'	50'	59'	76'	84'	93'	109'	133'

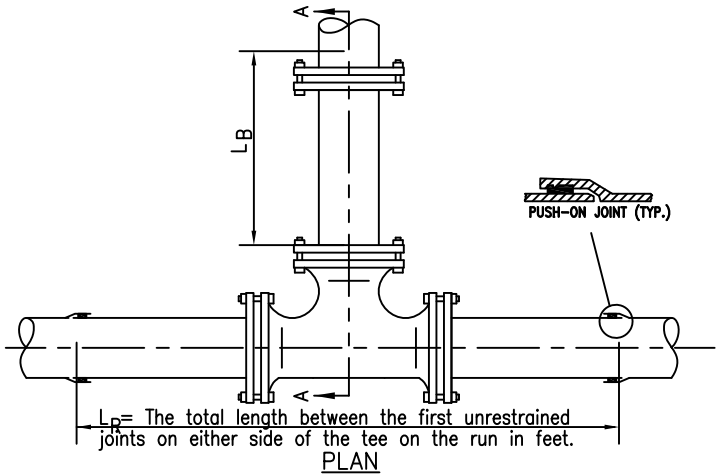
1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.

DECEMBER 2004

1.4.1–10

STAFFORD COUNTY DEPARTMENT OF UTILITIES

RESTRAINED LENGTHS FOR 11–1/4°, 22–1/2°, & 45° LOWER VERT. BENDS



RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
12"	12"	61'	87'	40'
12"	10"	38'	54'	40'
12"	8"	12'	18'	40'
12"	6"	5'	6'	26'
10"	10"	46'	65'	40'
10"	8"	22'	31'	40'
10"	6"	3'	5'	32'
10"	4"	1'	2'	16'
8"	8"	31'	44'	40'
8"	6"	3'	4'	40'
8"	4"	3'	4'	40'
6"	6"	15'	22'	40'
6"	4"	4'	6'	24'

RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
12"	12"	99'	141'	0
12"	10"	83'	119'	0
12"	8"	68'	98'	0
12"	6"	52'	75'	0
10"	10"	83'	119'	0
10"	8"	68'	98'	0
10"	6"	52'	75'	0
10"	4"	37'	52'	0
8"	8"	68'	98'	0
8"	6"	52'	75'	0
8"	4"	37'	52'	0
6"	6"	52'	75'	0
6"	4"	37'	52'	0

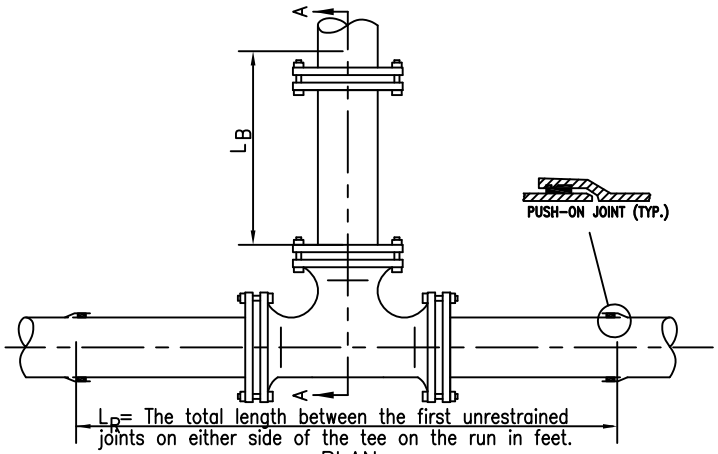
1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.

DECEMBER 2004

1.4.1–11A

STAFFORD COUNTY DEPARTMENT OF UTILITIES

RESTRAINED LENGTHS FOR TEES
SHEET 1 OF 3
RUN DIAMETER 6" TO 12"



RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
14"	8"	3'	4'	40'
14"	14"	76'	108'	40'
16"	6"	3'	4'	20'
16"	8"	4'	6'	34'
16"	10"	22'	32'	40'
16"	12"	47'	68'	40'
16"	16"	90'	129'	40'
18"	6"	2'	2'	18'
18"	8"	4'	6'	30'
18"	12"	41'	58'	40'
18"	18"	105'	150'	40'
20"	6"	2'	3'	16'
20"	8"	1'	2'	28'

RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
14"	8"	68'	98'	0
14"	14"	114'	163'	0
16"	6"	52'	75'	0
16"	8"	68'	98'	0
16"	10"	83'	119'	0
16"	12"	99'	141'	0
16"	16"	129'	184'	0
18"	6"	52'	75'	0
18"	8"	68'	98'	0
18"	12"	99'	141'	0
18"	18"	143'	205'	0
20"	6"	52'	75'	0
20"	8"	68'	98'	0

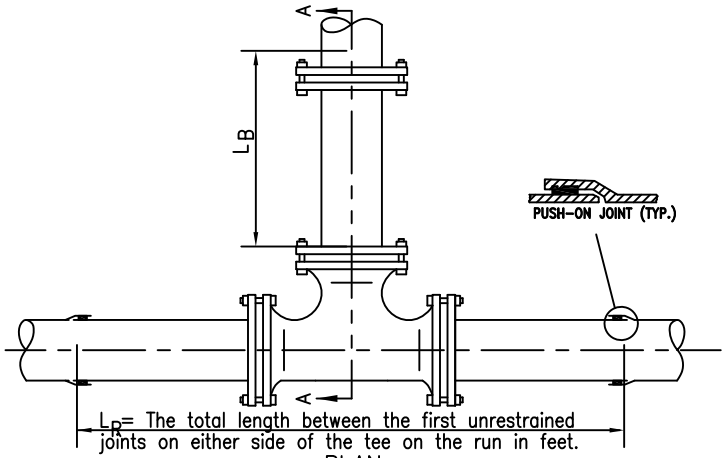
1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.

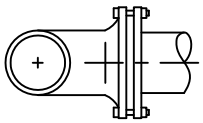
DECEMBER 2004

1.4.1–11B

STAFFORD COUNTY DEPARTMENT OF UTILITIES

RESTRAINED LENGTHS FOR TEES
SHEET 2 OF 3
RUN DIAMETERS 14" TO 20"





RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
20"	12"	34'	48'	40'
20"	16"	80'	114'	40'
20"	20"	119'	170'	40'
24"	6"	0	0	14'
24"	8"	4'	6'	22'
24"	10"	3'	4'	34'
24"	12"	19'	27'	40'
24"	14"	45'	65'	40'
24"	16"	69'	98'	40'
24"	18"	90'	129'	40'
24"	20"	110'	158'	40'
24"	24"	147'	211'	40'
30"	6"	3'	4'	10'

RUN DIAMETER	BRANCH DIAMETER	L_B: LENGTH OF RESTRAINED PIPE (TEE BRANCH)		L_R
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)	
20"	12"	99'	141'	0
20"	16"	129'	184'	0
20"	20"	158'	225'	0
24"	6"	52'	75'	0
24"	8"	68'	98'	0
24"	10"	83'	119'	0
24"	12"	99'	141'	0
24"	14"	114'	163'	0
24"	16"	129'	184'	0
24"	18"	143'	205'	0
24"	20"	158'	225'	0
24"	24"	187'	267'	0
30"	6"	52'	75'	0

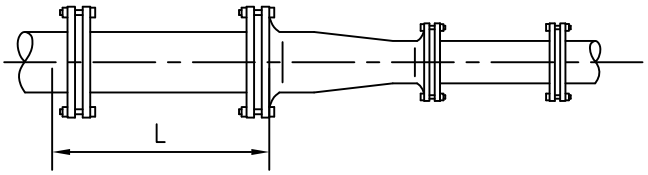
1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.

DECEMBER 2004

1.4.1–11C

STAFFORD COUNTY DEPARTMENT OF UTILITIES

RESTRAINED LENGTHS FOR TEES
SHEET 3 OF 3
RUN DIAMETERS 20" TO 30 "



PLAN

LARGE DIAMETER	SMALL DIAMETER	L : LENGTH OF RESTRAINED PIPE (LARGE DIAMETER)	
		Bare Ductile Iron Pipe (ft)	PVC & Polywrapped Pipe (ft)
24"	20"	56'	80'
24"	18"	80'	114'
24"	16"	102'	145'
24"	14"	121'	173'
24"	12"	138'	197'
20"	18"	29'	42'
20"	16"	55'	79'
20"	14"	79'	112'
20"	12"	99'	141'
20"	10"	116'	166'
18"	16"	29'	42'
18"	14"	55'	79'
18"	12"	78'	111'
18"	10"	97'	138'
18"	8"	112'	161'
16"	14"	29'	42'
16"	12"	55'	78'
16"	10"	76'	109'
16"	8"	94'	134'
16"	6"	108'	155'
14"	12"	29'	42'
14"	10"	54'	77'
14"	8"	74'	106'
14"	6"	91'	129'
12"	10"	29'	41'
12"	8"	52'	75'
12"	6"	72'	102'
10"	8"	28'	40'
10"	6"	51'	73'
10"	4"	68'	97'
8"	6"	29'	41'
8"	4"	49'	70'
6"	4"	27'	39'

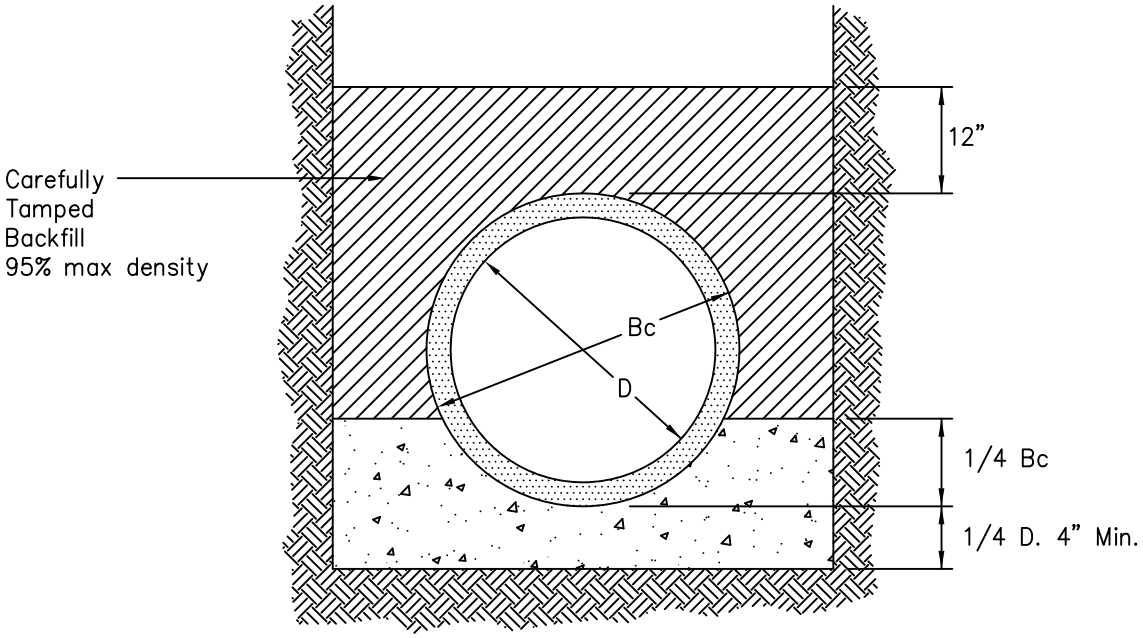
1) SOIL DESIGNATION IS COHESIVE GRANULAR
2) MINIMUM DEPTH OF COVER IS 3.5 FT.
3) USE TYPE 3 LAYING CONDITIONS.
4) DESIGN PRESSURE IS 100 PSI WORKING PRESSURE + 120 PSI SURGE ALLOWANCE
5) SAFETY FACTOR IS 1.5
6) THE ENGINEER SHALL INCREASE THE ABOVE LENGTHS FOR WORKING PRESSURES GREATER THAN 100 PSI
7) THE ENGINEER SHALL INDIVIDUALLY EVALUATE ALL COMBINED BENDS AND INDICATE THE REQUIRED LENGTHS ON THE PROFILE VIEW.

DECEMBER 2004

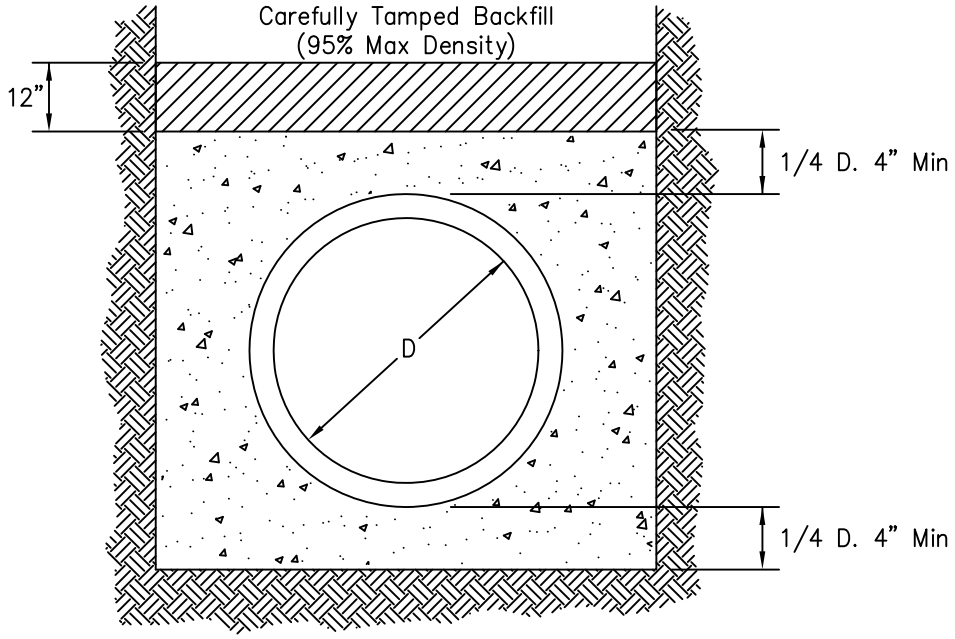
1.4.1–12

STAFFORD COUNTY DEPARTMENT OF UTILITIES

RESTRAINED LENGTHS FOR REDUCERS



STANDARD CONCRETE CRADLE

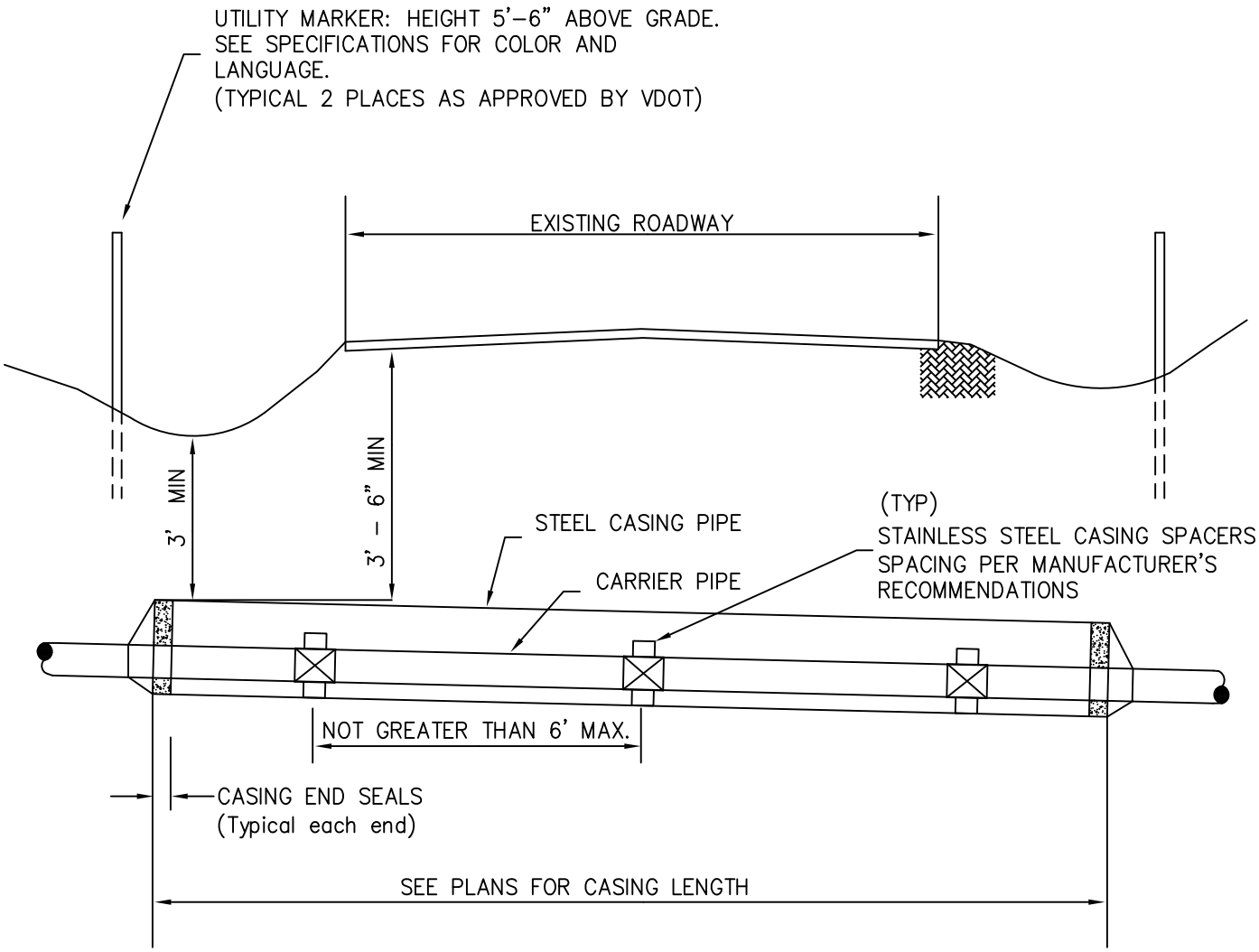


STANDARD CONCRETE ENCASEMENT

NOTES:

1. Concrete To Be 3000 PSI Unless Otherwise Specified.
2. Trench Width Shall Be As Specified Or As Shown On Plans.

DECEMBER 2004	1.4.2–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	STANDARD CONCRETE CRADLE & ENCASEMENT



RESTRAIN ALL JOINTS INSIDE CASING.
PUSH OR PULL THE CARRIER PIPE THROUGH THE CASING SO THAT THE CARRIER PIPE JOINTS ARE ALWAYS COMPRESSED.

Carrier Pipe	CASING PIPE		
	Minimum Casing Pipe O. D.	Minimum Casing Thickness *	
		Cover to 15'	Cover 15' & over
4	14	1/4"	5/16"
6	16	1/4"	5/16"
8	18	1/4"	5/16"
10	18	1/4"	5/16"
12	24	1/4"	5/16"
14	24	1/4"	5/16"
16	30	1/4"	5/16"
18	30	3/8"	3/8"
20	30	3/8"	3/8"
24	36	3/8"	3/8"
30	42	7/16"	7/16"
36	48	7/16"	7/16"
42	54	7/16"	7/16"
48	60	7/16"	7/16"
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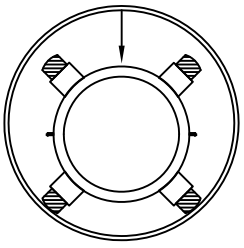
*NOTE: or as required by VDOT

POSITIONING



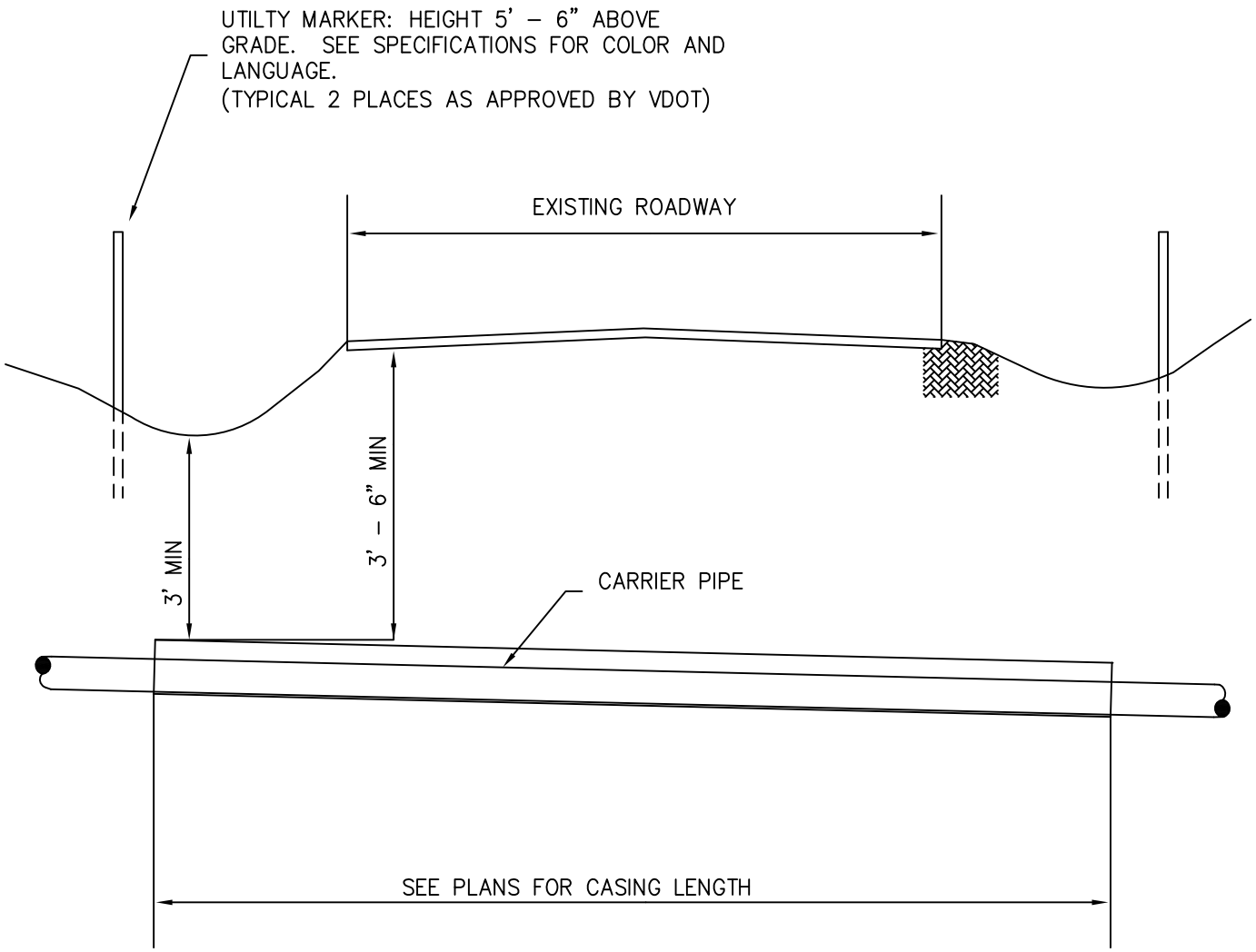
STANDARD: Carrier lays on casing bottom. Top runners maintain spacing in event of rollover.

MARCH 2006

1.4.2–2A

STAFFORD COUNTY DEPARTMENT OF UTILITIES

STEEL CASING FOR PVC OR DIP

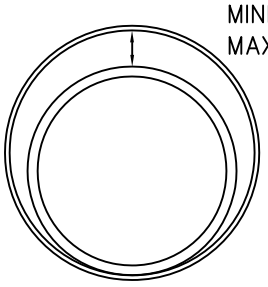


Carrier Pipe	CASING PIPE	
	Minimum Casing Thickness *	
	Cover to 15'	Cover 15' & over
4	1/4"	5/16"
6	1/4"	5/16"
8	1/4"	5/16"
10	1/4"	5/16"
12	1/4"	5/16"
14	1/4"	5/16"
16	1/4"	5/16"
18	3/8"	3/8"
20	3/8"	3/8"
24	3/8"	3/8"
30	7/16"	7/16"
36	7/16"	7/16"
42	7/16"	7/16"
48	7/16"	7/16"
----	----	----

*NOTE: or as required by VDOT

MINIMUM DR RATING FOR GRAVITY SEWER IS 32.5
MINIMUM DR RATING FOR PRESSURE APPLICATION IS 17.0

SEAL ANNULAR SPACE AT BOTH ENDS WITH POLYURETHANE GROUT AND CASING END SEALS



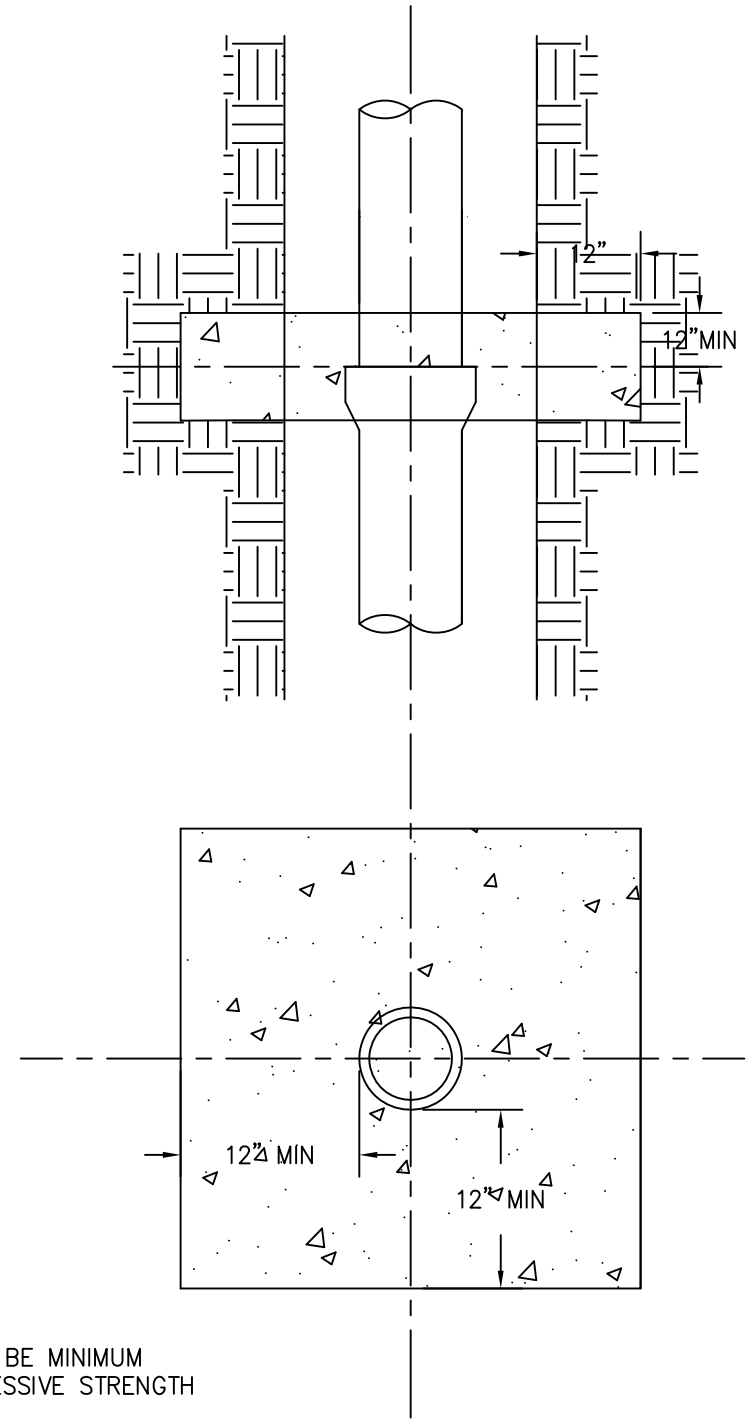
STANDARD: Carrier lays on casing bottom.

MARCH 2006

1.4.2–2B

STAFFORD COUNTY DEPARTMENT OF UTILITIES

STEEL CASING FOR HDPE



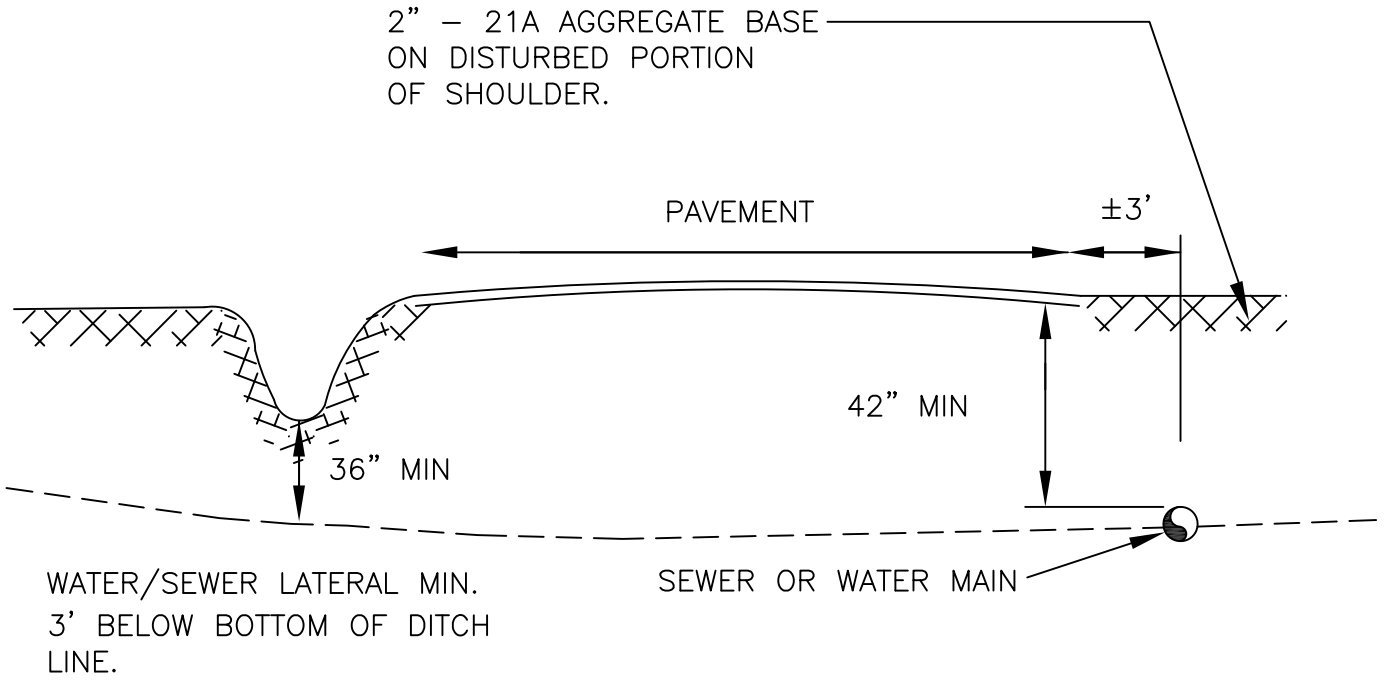
NOTE:
1. CONCRETE SHALL BE MINIMUM 3000 PSI COMPRESSIVE STRENGTH

February 2017

1.4.2–3

STAFFORD COUNTY DEPARTMENT OF UTILITIES

CONCRETE COLLAR FOR STEEP SLOPES

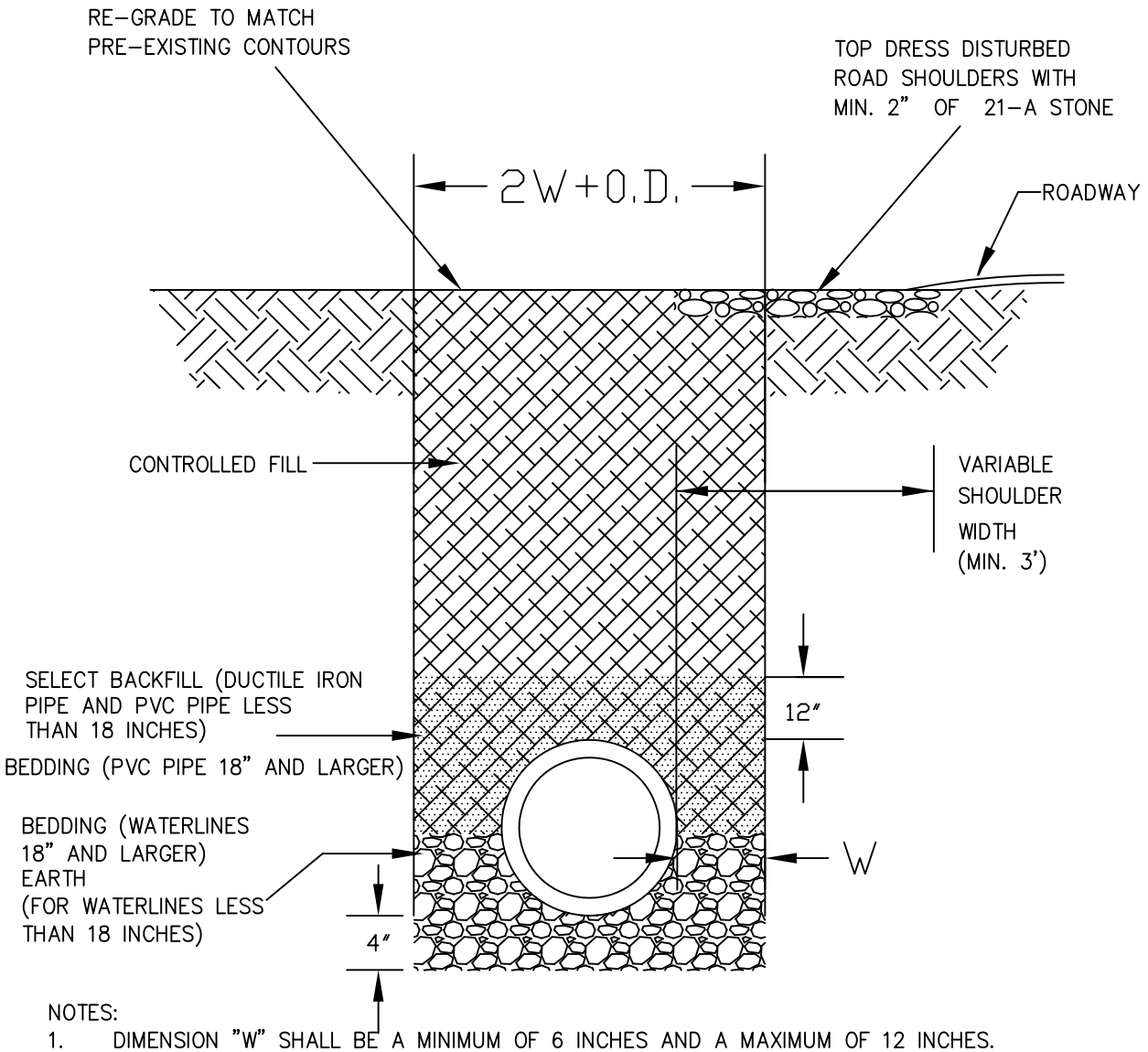


DECEMBER 2004

1.5.1–1

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

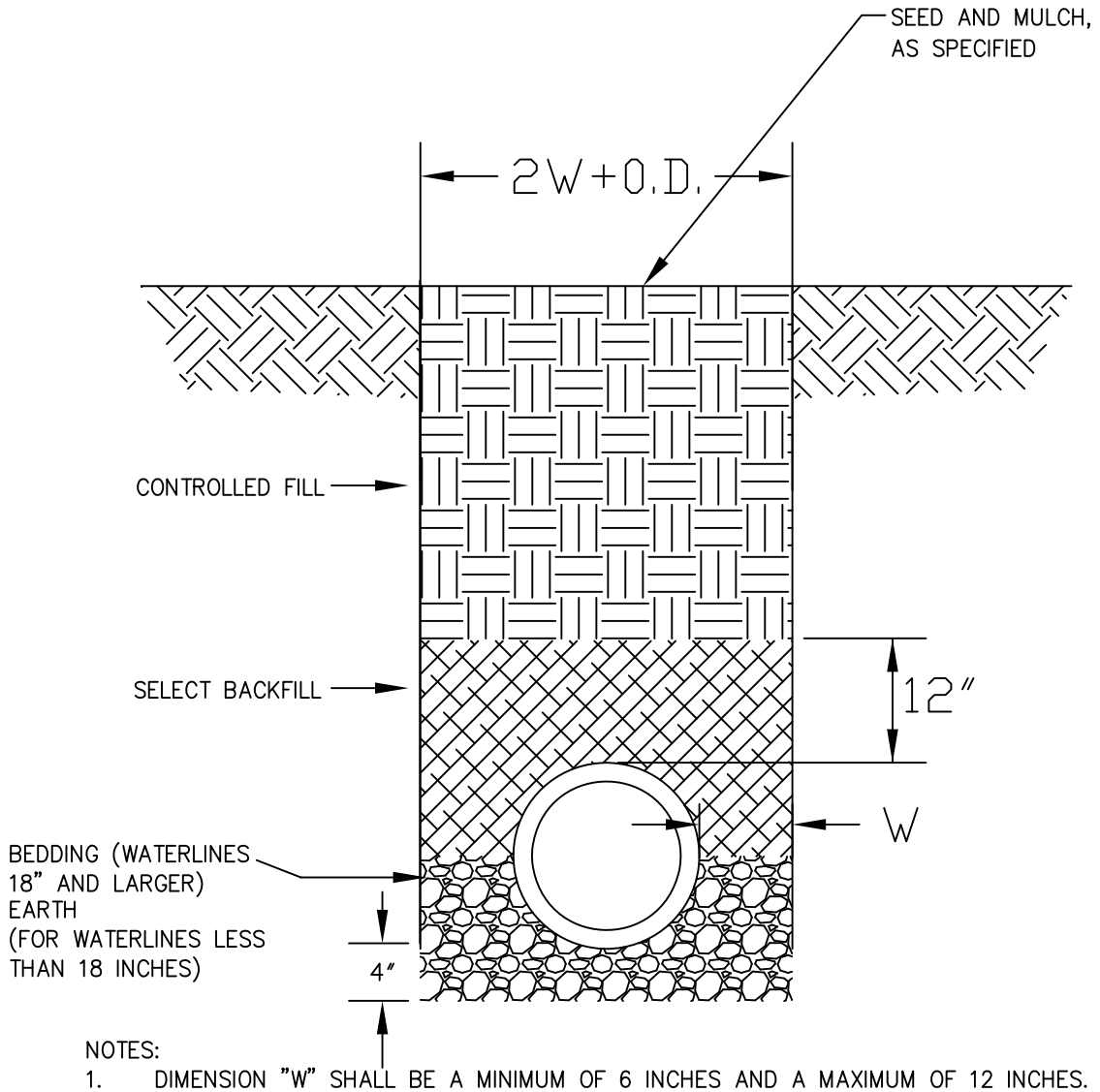
TYPICAL PIPE LOCATION
EXISTING ROADWAYS



NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE AND PVC PIPE SMALLER THAN 18 INCHES.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE, 18"AND LARGER.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ALL PIPES SMALLER THAN 18 INCHES SHALL BE IN HANDSHAPED UNDISTURBED OR RECOMMENDED EARTH TO THE SPRING LINE.
7. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
8. ALL PIPE SHALL BE MARKED WITH TRACER WIRE ATTACHED TO THE PIPE AND 3-INCH MARKING TAPE, 2-INCHES ABOVE THE PIPE.
9. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

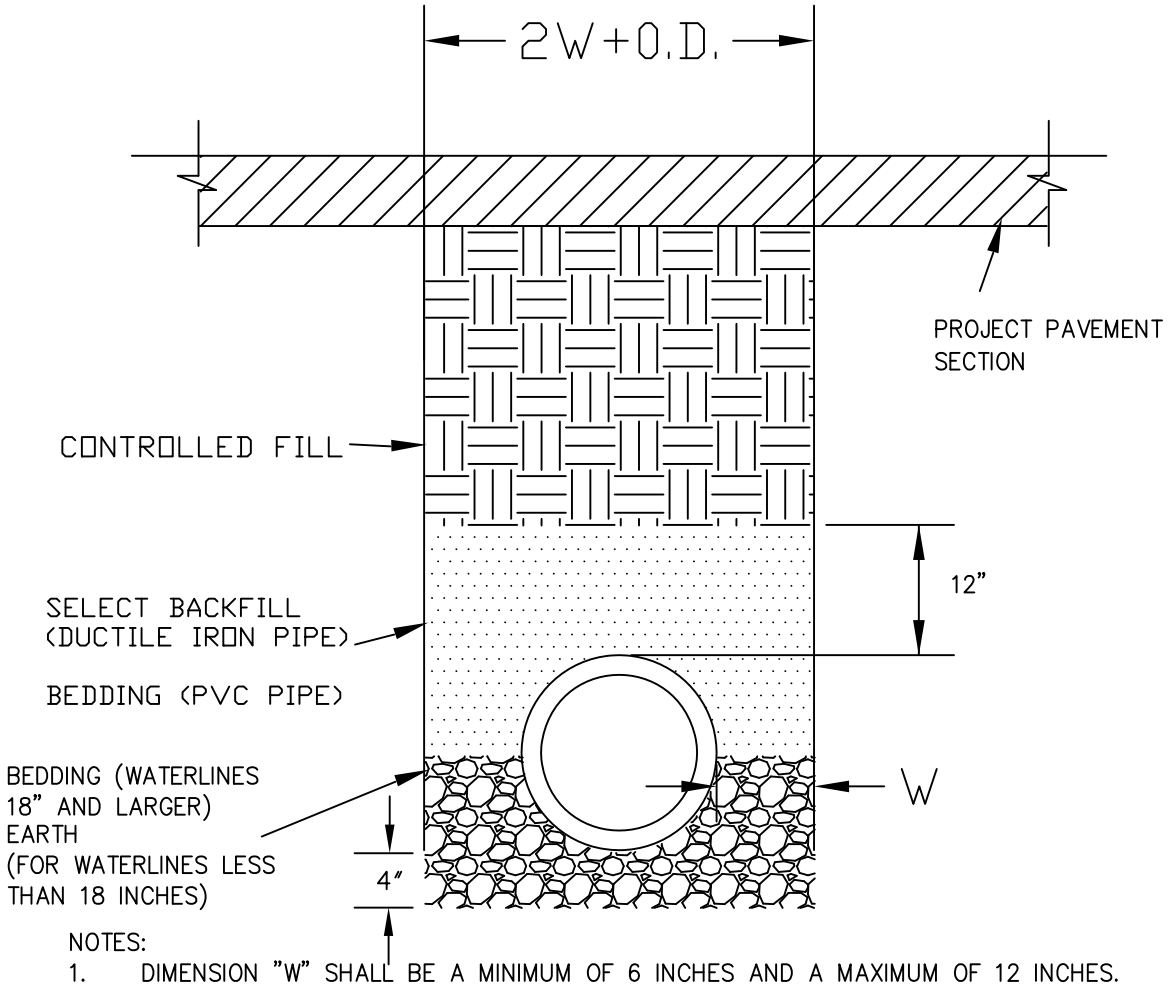
SEPT 2016	1.5.2-1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR WATERLINES AND FORCE MAINS IN SHOULDER OF ROAD



NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE AND PVC PIPE SMALLER THAN 18 INCHES.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE, 18"AND LARGER.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ALL PIPES SMALLER THAN 18 INCHES SHALL BE IN HANDSHAPED UNDISTURBED OR RECOMMENDED EARTH TO THE SPRING LINE. REMOVE ROCKS & STONES A MIN. OF 6–INCHES BELOW WATER MAIN.
7. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
8. ALL PIPE SHALL BE MARKED WITH TRACER WIRE ATTACHED TO THE PIPE AND 3–INCH MARKING TAPE, 2–INCHES ABOVE THE PIPE.
9. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

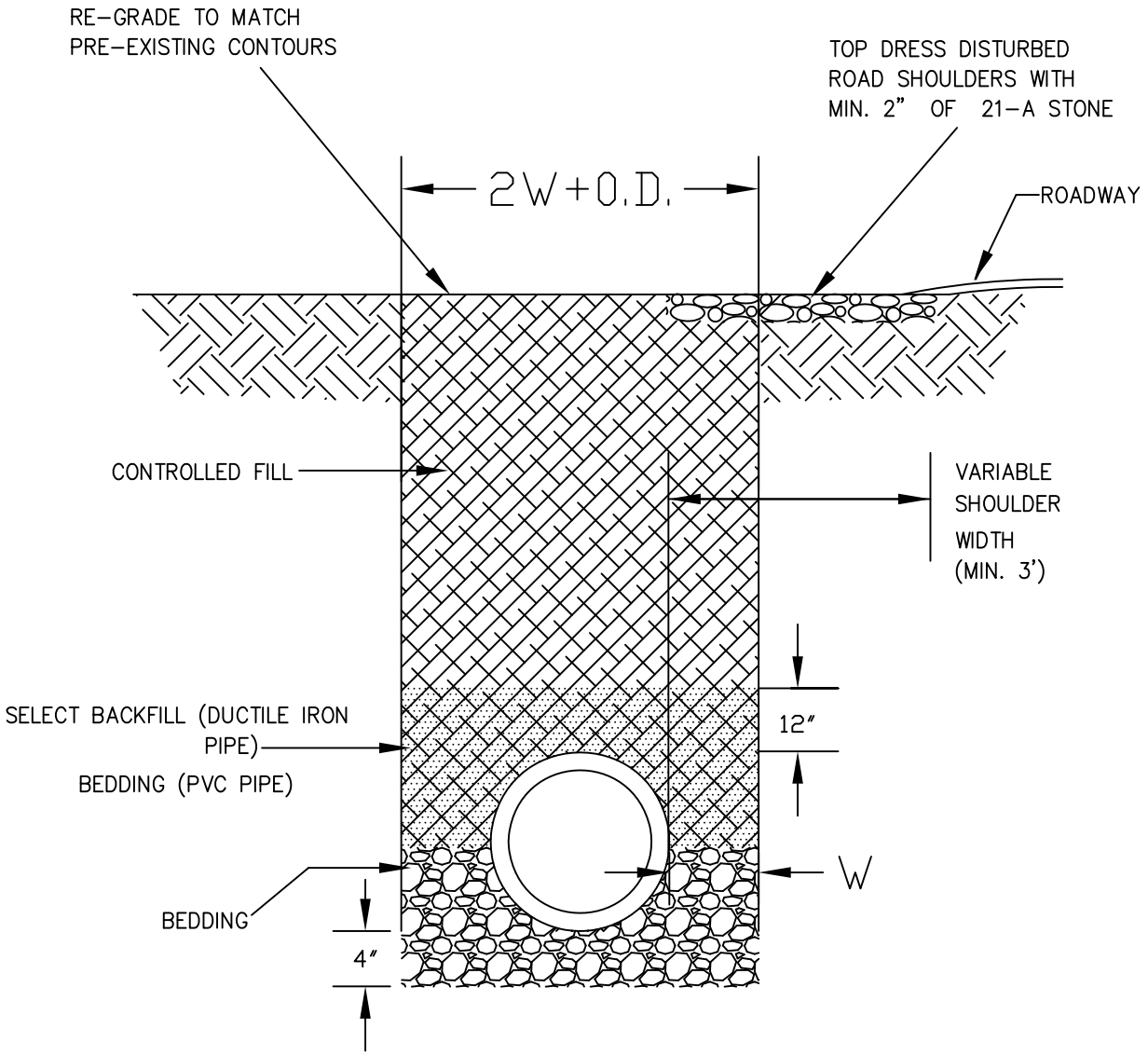
SEPT 2016	1.5.2–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR WATERLINES AND FORCE MAINS IN NON–PAVED AREAS



NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE AND PVC PIPE SMALLER THAN 18 INCHES.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE, 18"AND LARGER.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ALL PIPES SMALLER THAN 18 INCHES SHALL BE IN HANDSHAPED UNDISTURBED OR RECOMMENDED EARTH TO THE SPRING LINE.
7. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
8. ALL PIPE SHALL BE MARKED WITH TRACER WIRE ATTACHED TO THE PIPE AND 3–INCH MARKING TAPE, 2–INCHES ABOVE THE PIPE.
9. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

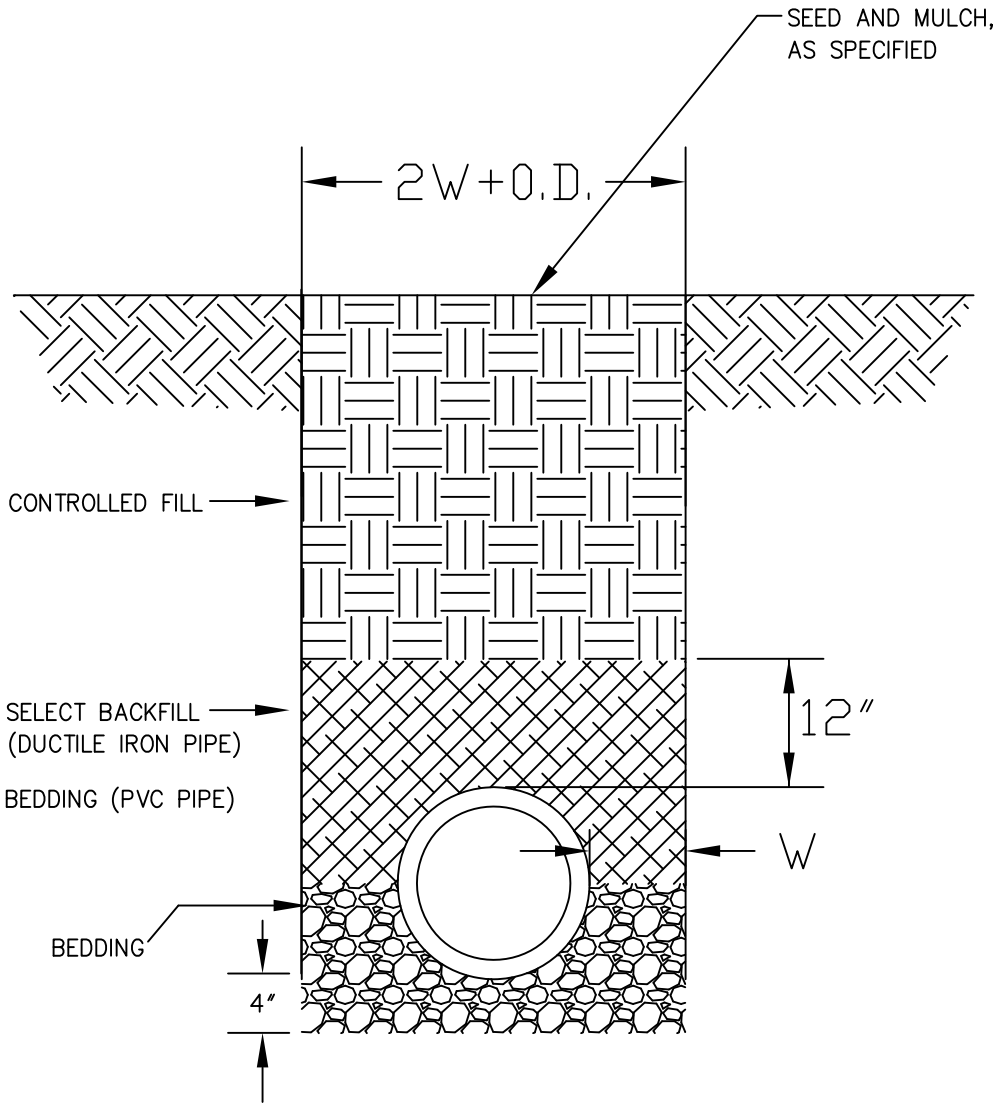
SEPT 2016	1.5.2–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR WATERLINES AND FORCE MAINS BENEATH PAVEMENT



NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
7. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

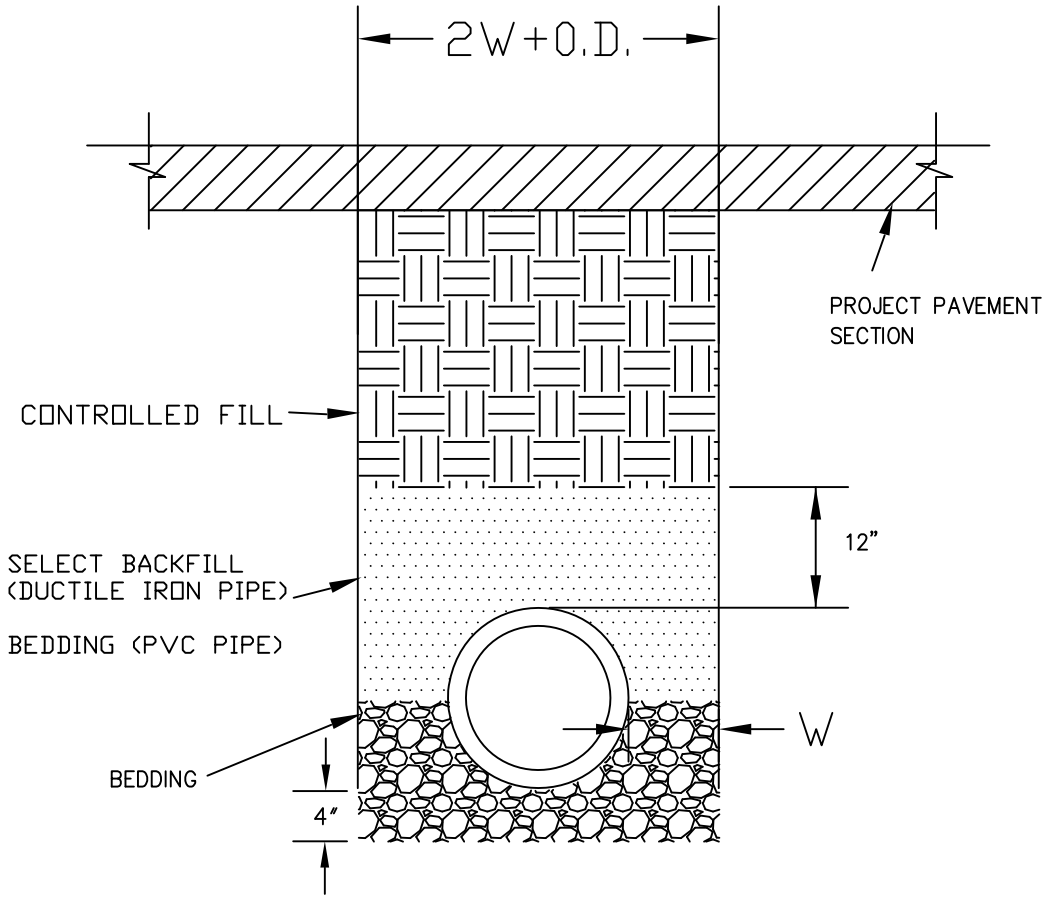
OCTOBER 2015	1.5.2-4
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR SEWERS IN SHOULDER OF ROAD



NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
7. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

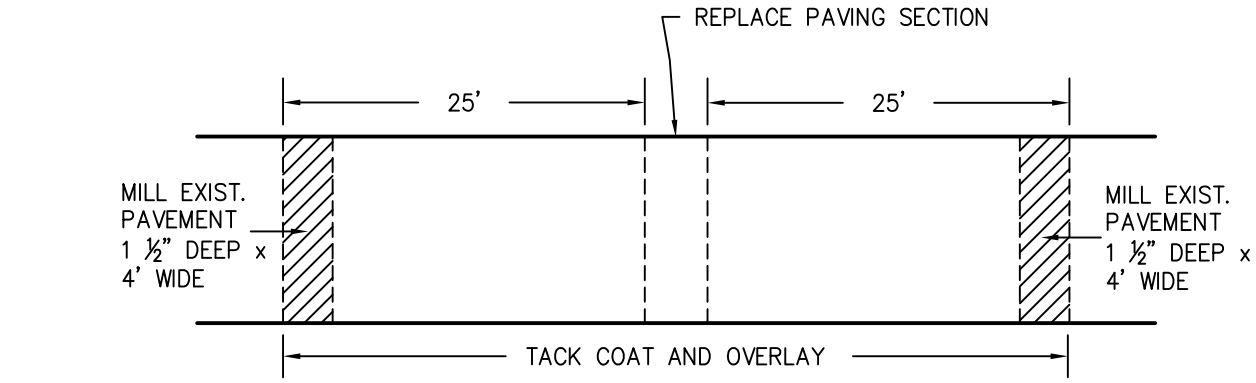
OCTOBER 2015	1.5.2–5
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR SEWERS IN NON–PAVED AREAS



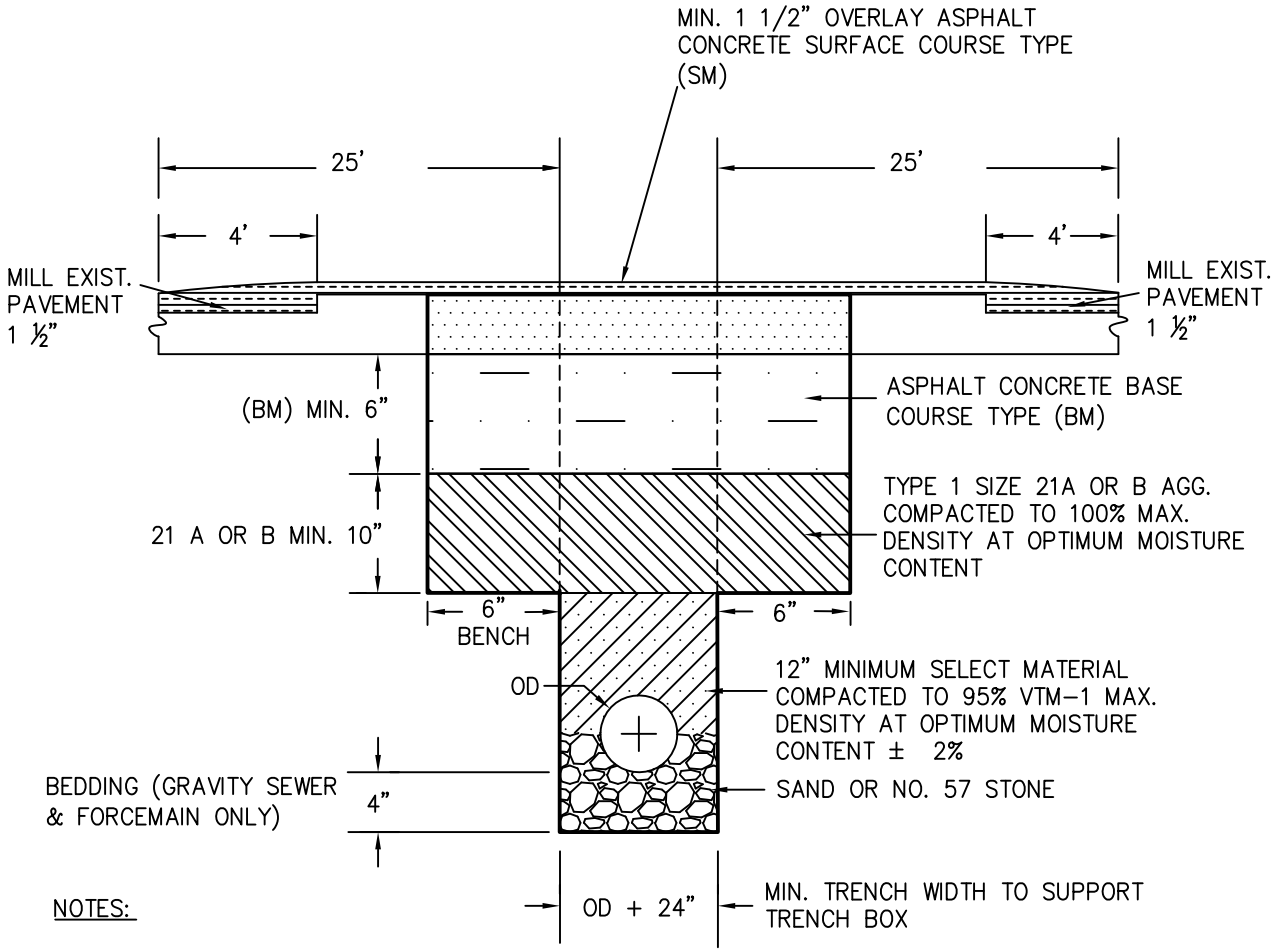
NOTES:

1. DIMENSION "W" SHALL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
2. CONTROLLED FILL TO EXTEND TO GRADE.
3. SELECT BACKFILL TO EXTEND 12 INCHES OVER CROWN OF DUCTILE IRON PIPE.
4. BEDDING TO EXTEND 12" OVER CROWN OF PVC PIPE.
5. BEDDING SHALL BE PLACED FOR A MINIMUM OF 4" BELOW BOTTOM OF PIPE TO THE SPRING LINE OF THE PIPE, 18"AND LARGER.
6. ANY OVEREXCAVATION TO BE BACKFILLED WITH SELECT BACKFILL.
7. REFER TO WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS AND/OR PROJECT SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

OCTOBER 2015	1.5.2–6
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRENCH FOR SEWERS BENEATH PAVEMENT



PLAN VIEW



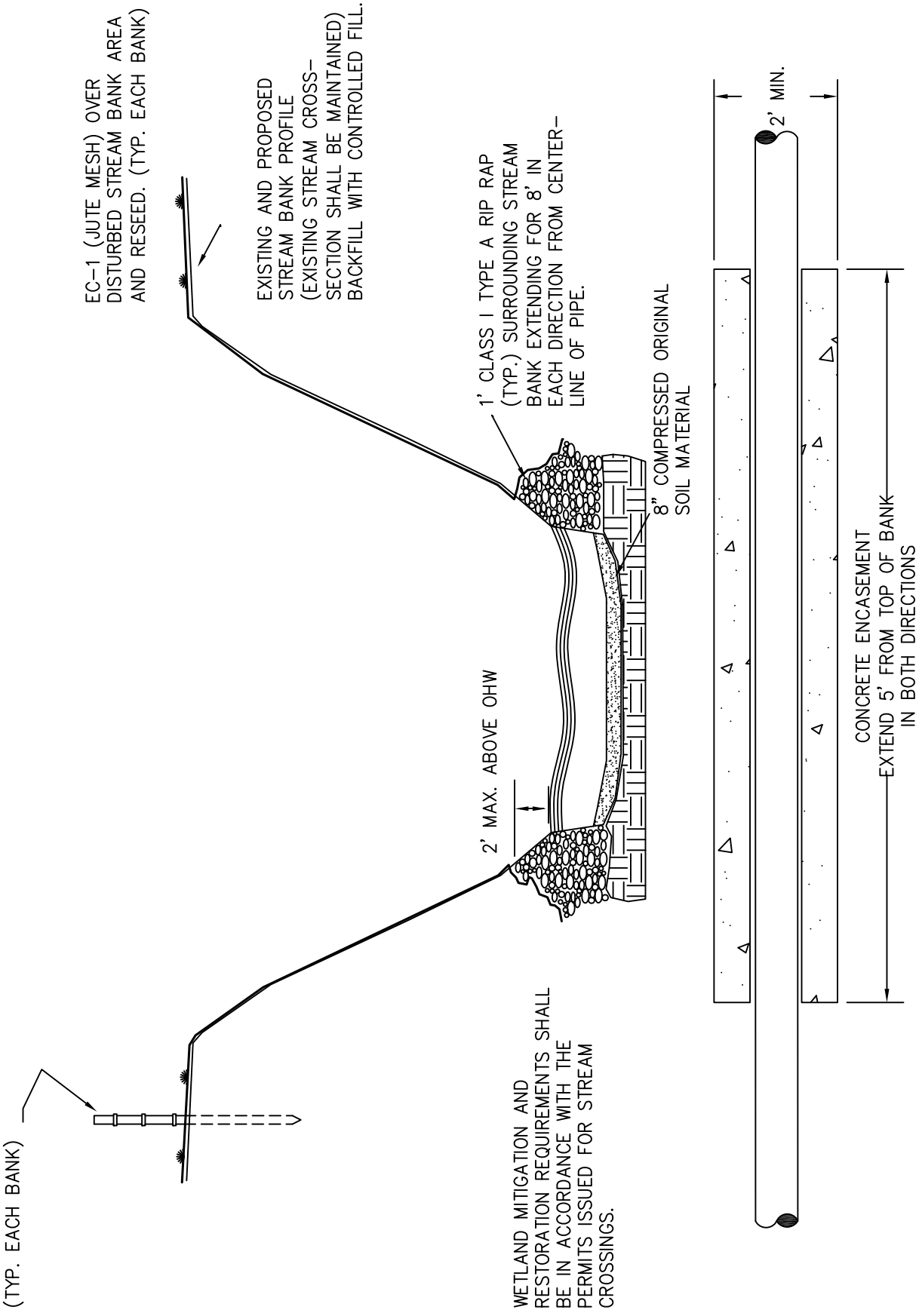
NOTES:

1. REGRADE SHOULDERS TO MATCH PAVEMENT ELEVATION.
2. RE-STRIPE PAVING TO MATCH PRE-CONSTRUCTION CONDITION.

SECTION VIEW

* FOR PIPE LESS THAN 12" THE TRENCH WIDTH MAY BE 36" MAXIMUM
SEE UB-1 (VDOT ROAD AND BRIDGE STANDARDS VOLUME II)

SEPT 2016	1.5.2-7
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATER & SEWER TRENCH DETAIL FOR EXISTING ROADWAYS

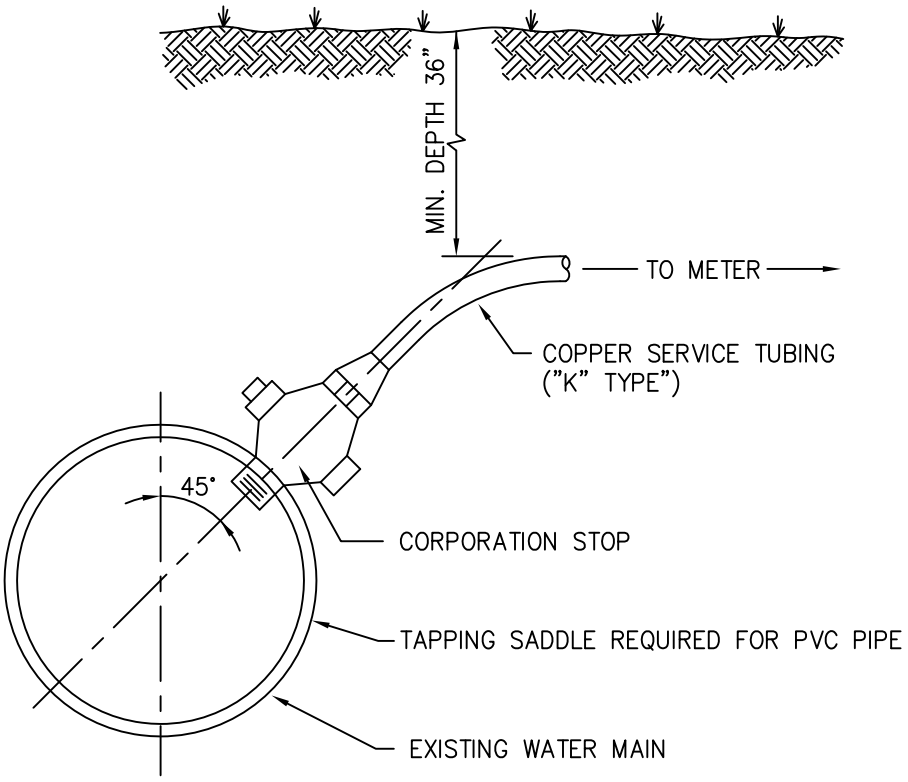


DECEMBER 2004

1.5.3–1

STAFFORD COUNTY DEPARTMENT OF UTILITIES

STANDARD STREAM CROSSING DETAIL

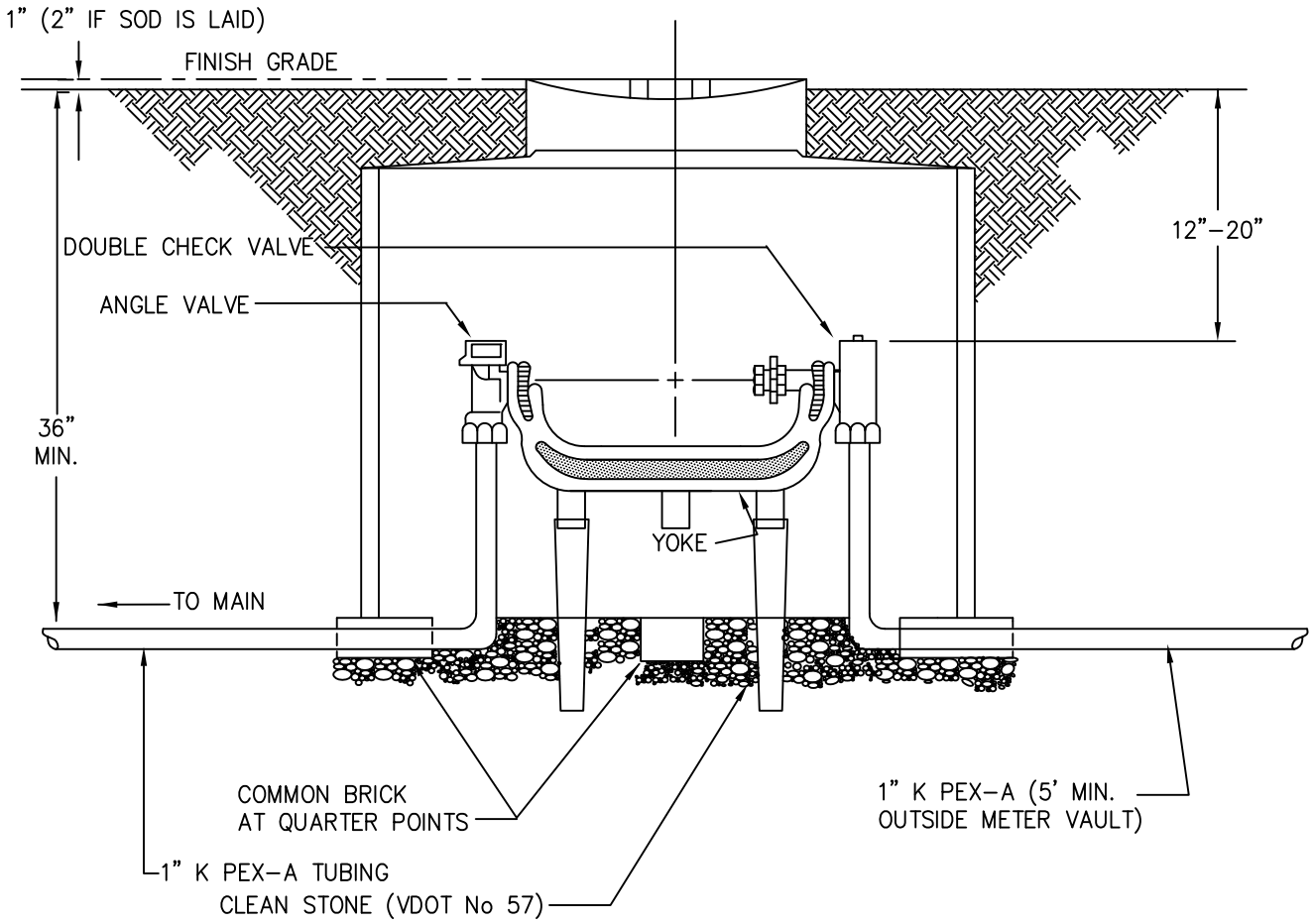


DECEMBER 2004

2.2.1–1

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

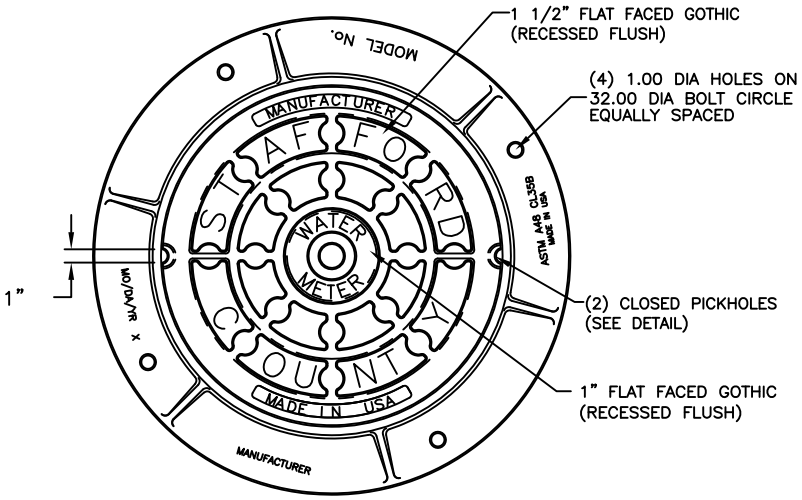
WATER SERVICE
CONNECTION DETAIL



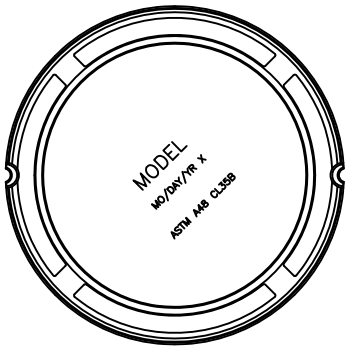
NOTES:

1. THE SERVICE LINE BETWEEN THE MAIN AND THE METER WILL BE ONE CONTINUOUS PIECE OF PIPE.
2. ONE PIECE METER BARREL 24" x 30" HIGH DENSITY POLYETHELENE.
3. LID SHALL HAVE PENTAGON NUT AND 1 3/4 " HOLE.
4. THE GRADE AT TOP OF BARREL SHALL CONFORM TO THE GENERAL CONTOUR OF FINISH YARD GRADE. NO MOUNDS OR DEPRESSIONS AROUND THE BARREL WILL BE PERMITTED.
5. 1" SERVICE SADDLE AND COMPRESSION STOP REQUIRED FOR CONNECTION TO C900 SDR 18, THIN WALL PVC AND TRANSITE MAINS, DIRECT TAP C900 SDR 14, DIP AND CIP MAINS.
6. USE 18" LID WITH EXTENSION RING IN GRASSED AREAS OR 24" MONITOR STYLE LID IN PAVED AREAS.
7. SUPPORT YOKE BAR AT TWO PRONGS WITH 3/4 INCH PIPE DRIVEN INTO GROUND.

JULY 2016	2.2.2–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATER METER SETTING 5/8", 3/4" METERS

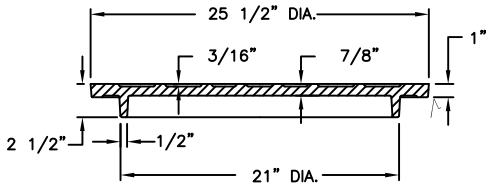


PLAN VIEW TOP

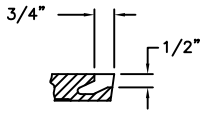


PLAN VIEW
BOTTOM OF COVER

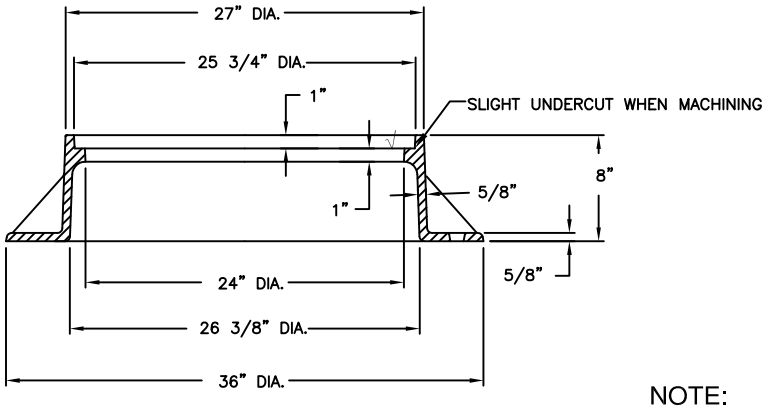
WEIGHT: FRAME, 215 LBS
COVER, 125 LBS
TOTAL, 340 LBS



SECTION OF COVER



PICKHOLE DETAIL

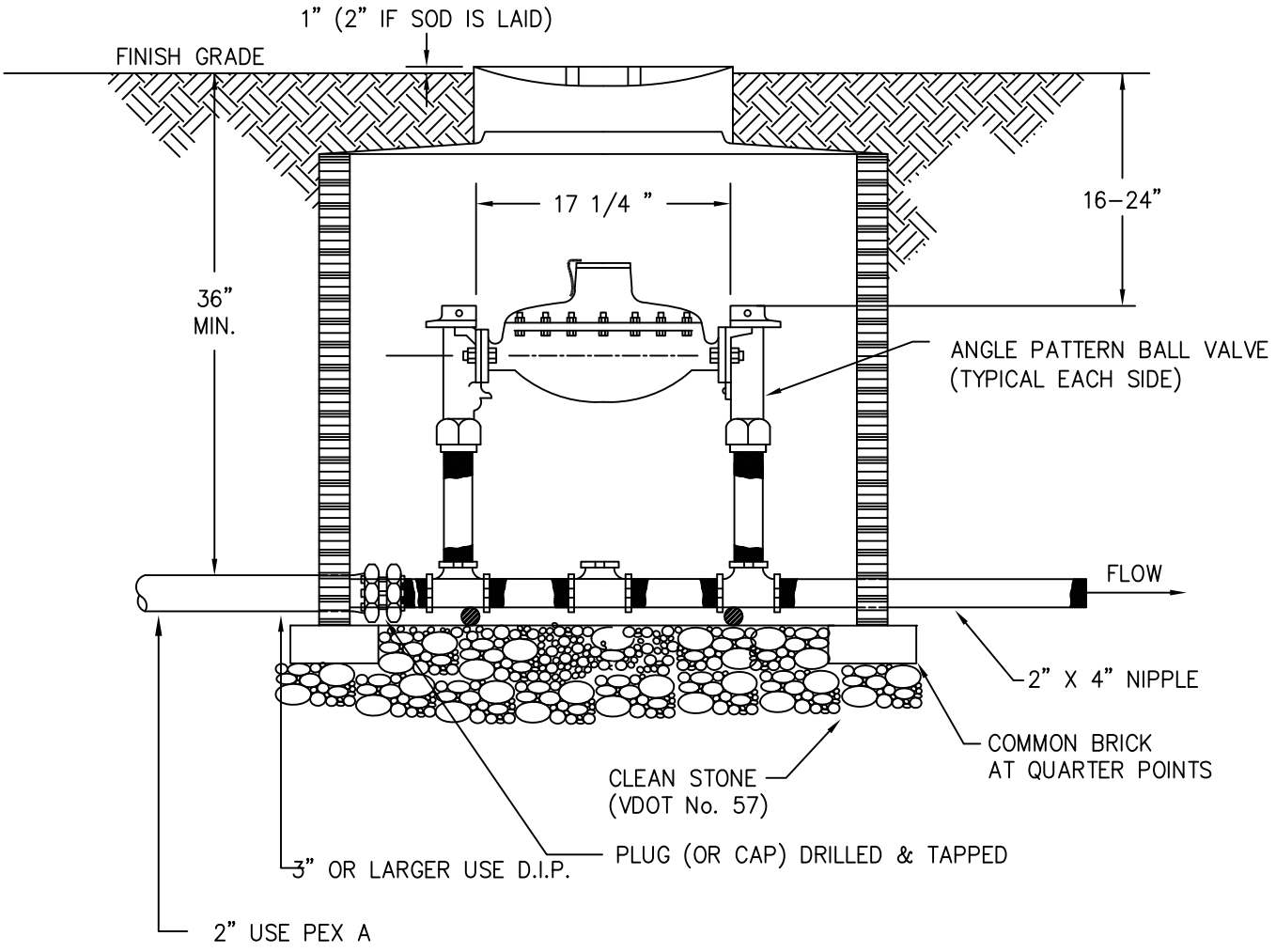


SECTION OF FRAME

√ MACHINED SURFACE

NOTE:
FOR REQUIREMENTS ON SECURING FRAME TO CONE, SEE DETAIL 3.2.1-4

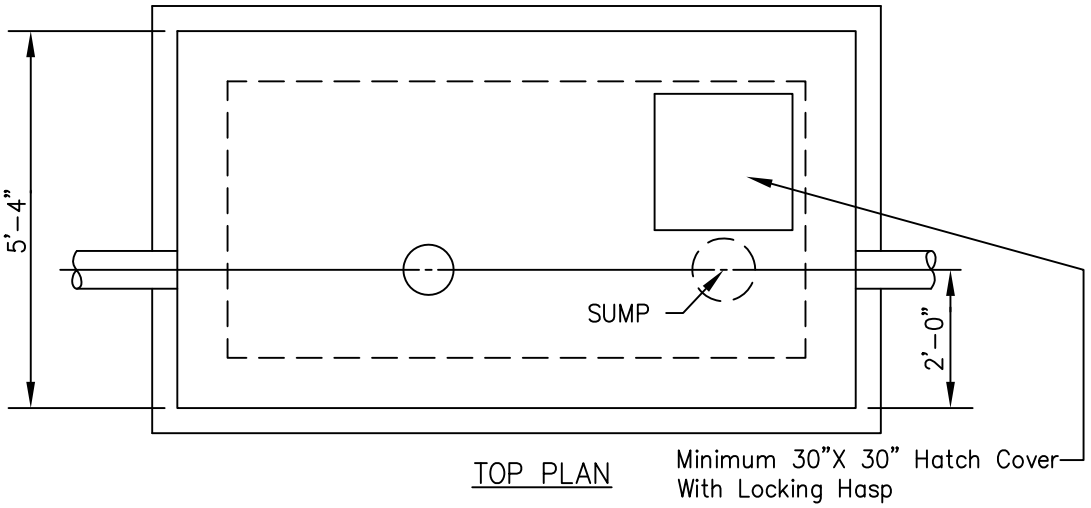
JULY 2016	2.2.2–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRAFFIC RATED WATER METER FRAME & COVER

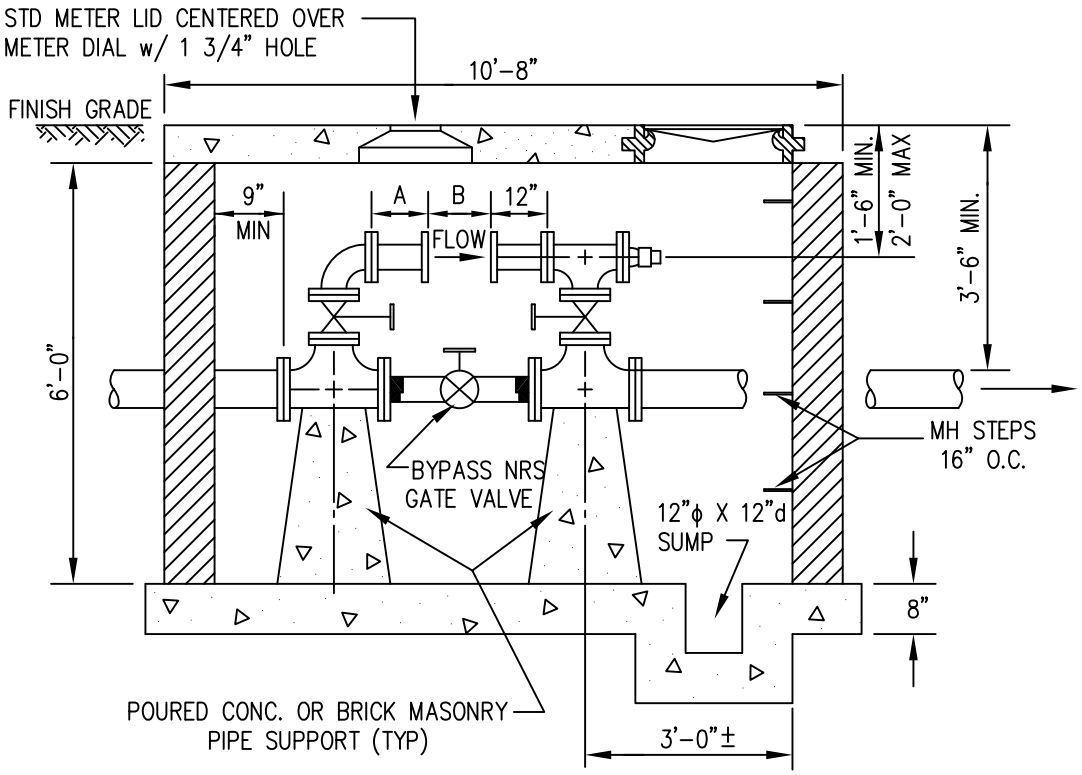


NOTES:

1. ONE PIECE BARREL 36" X 36" HI–DENSITY POLYETHELENE.
2. LID SHALL BE EQUIPPED WITH PENTAGON NUT AND 1 3/4" HOLE.
3. USE SERVICE SADDLE FOR CONNECTION TO MAIN (BOTH PVC AND DIP).
4. GATE VALVE AND VALVE BOX REQUIRED ON 2" AND LARGER SERVICE LINES. USE 2" BRASS OR DUCTILE IRON NIPPLES BETWEEN SERVICE SADDLE AND GATE VALVE.
5. SCHEDULE 80 PLASTIC PIPE (2) EACH 16" LONG TO BE USED IN BRACE PIPE EYELETS.
6. IF AN APPROVED BACKFLOW DEVICE IS NOT INSTALLED ON THE SERVICE LINE IMMEDIATELY INSIDE THE BUILDING, DOUBLE CHECK VALVES SHALL BE SUBSTITUTED FOR THE ANGLE PATTERN BALL VALVE ON THE DOWNSTREAM SIDE OF THE METER & ADDED TO THE BYPASS.
7. THE GRADE AT THE TOP OF THE BARREL SHALL CONFORM TO THE GENERAL CONTOUR OF FINISH YARD GRADE. NO MOUNDS OR DEPRESSIONS AROUND THE BARREL WILL BE PERMITED.

SEPT 2016	2.2.2–4
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATER METER SETTING UP TO AND INCLUDING 2" METER CONNECTIONS

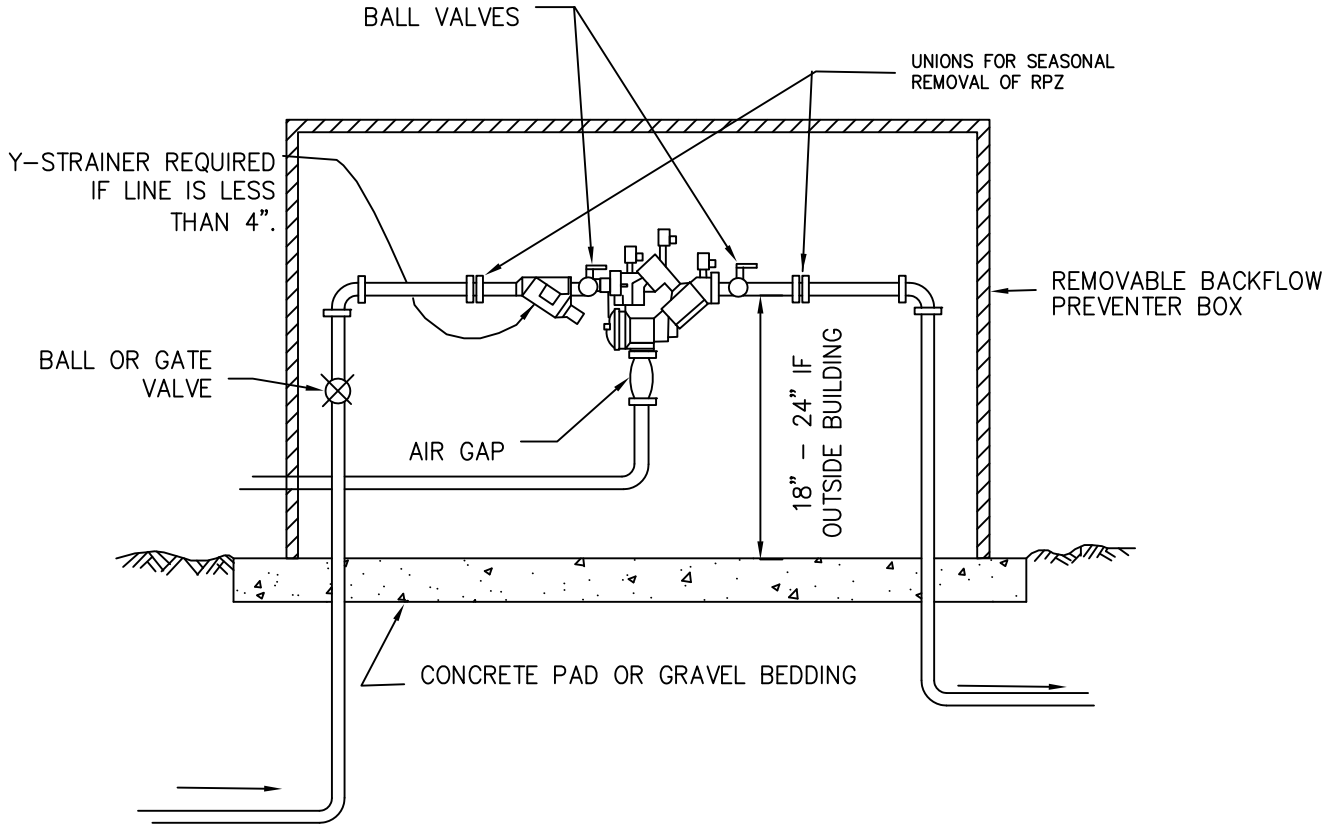




NOTES:

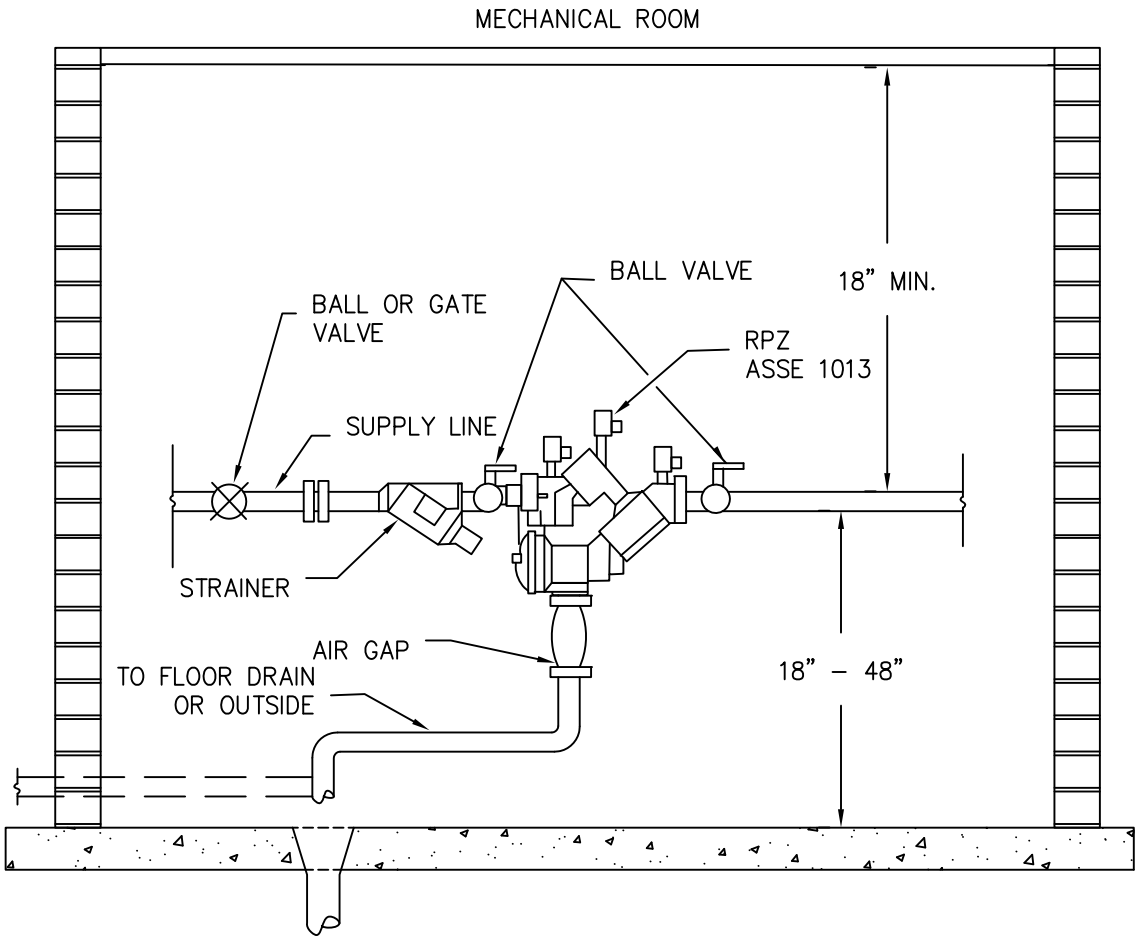
1. DIM. "A" EQUALS 8 TIMES NOMINAL METER SIZE.
2. DIM. "B" TO ACCOMMODATE METER & STRAINER.
3. BYPASS DIAMETER ONE SIZE SMALLER THAN METER.
4. BYPASS OF BRASS OR D.I. PIPE W/MATCHING VALVE.
5. ALL PIPE JOINTS SHALL BE EITHER SCREWED (UNDER 3"ø) OR FLANGED (3"ø AND OVER).
6. SHOP DRAWINGS SHALL BE SUBMITTED TO DEPARTMENT OF UTILITIES FOR APPROVAL.
7. SUMP AREA MUST BE DAY LIGHTED OR FURNISH AND INSTALL A PUMP.
8. WALL PENETRATIONS SHALL BE SEALED WITH MODULAR WALL SEAL.

DECEMBER 2004	2.2.2–5
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATER METER SETTING 3" AND LARGER METERS



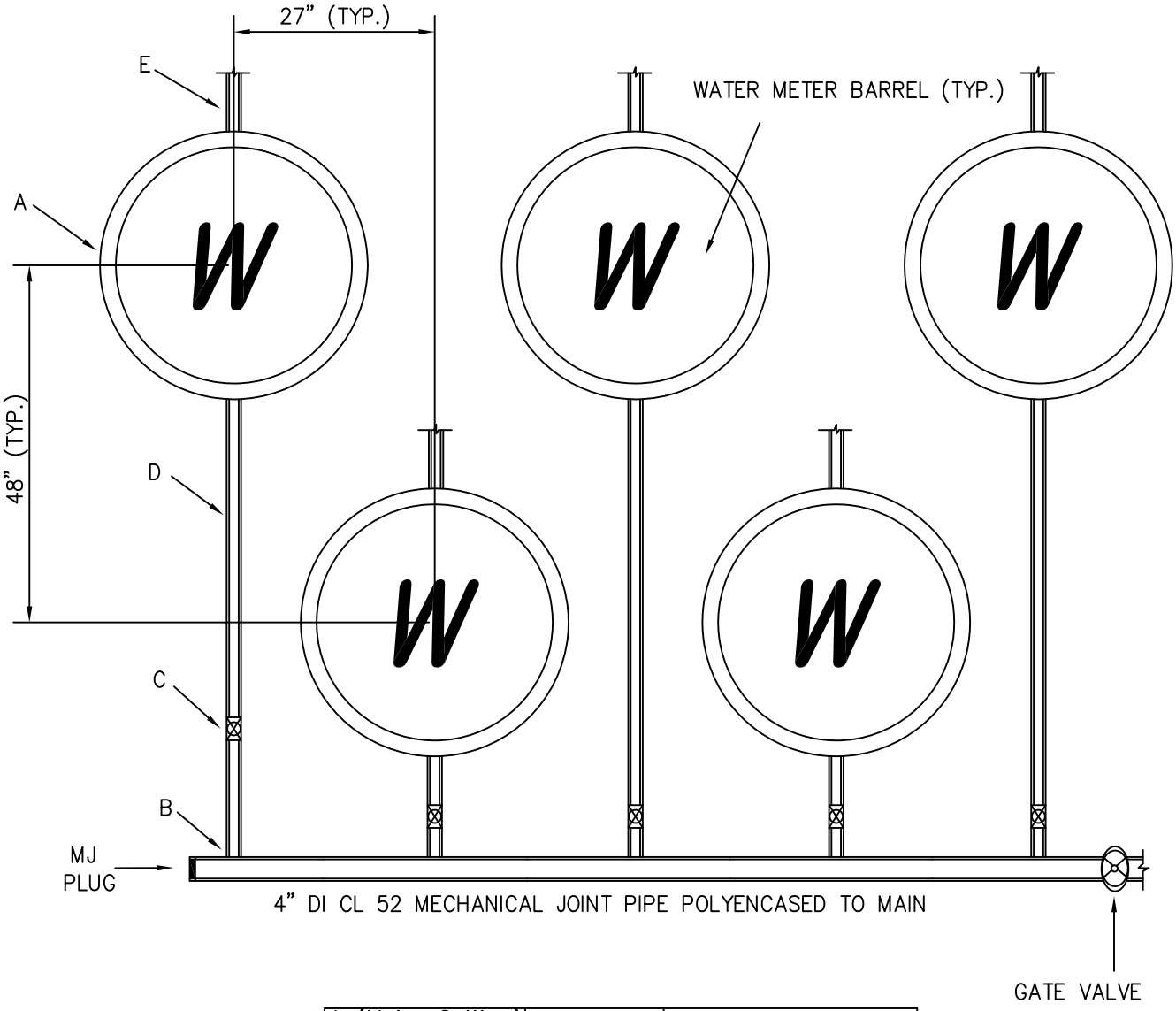
NOTES:

1. ALL PIPING THROUGH CONCRETE TO BE SLEEVED.
2. RPZ DEVICE SHALL BE READILY ACCESSIBLE FOR INSPECTION AND TESTING.
3. NO CONNECTION WILL BE PERMITTED ON SUPPLY LINE BETWEEN METER AND RPZ.
4. INSTALLATION OF ASSE 1013 IN A PIT IS NOT PERMITTED.
5. GATE VALVES MAY BE USED IF DEVICE IS 2" OR LARGER.
6. BACKFLOW PREVENTER BOX SHALL BE HEATED AND INSULATED, AND APPROVED IN STAFFORD COUNTY.



NOTES:

1. ALL PIPING THROUGH CONCRETE TO BE SLEEVED.
2. RPZ DEVICE SHALL BE READILY ACCESSIBLE FOR INSPECTION AND TESTING.
3. NO CONNECTION WILL BE PERMITTED ON SUPPLY LINE BETWEEN METER AND RPZ.
4. INSTALLATION OF RPZ DEVICE IN PIT IS NOT PERMITTED.
5. 2" AND OVER – GATE VALVES MAY BE USED WHERE BALL VALVES INDICATED.
6. 30" OF FREE SPACE IN FRONT OF BACKFLOW.



A (Meter Setting)	1"	2"
Detail	2.2.2-1	2.2.2-4
B	1" Corp Stop	2" Threaded Brass Nipple
C	N/A	2" Threaded Gate Valve
D	1" K COPPER	2" Threaded Brass Nipple
E	1" K COPPER	2" Threaded Brass Nipple

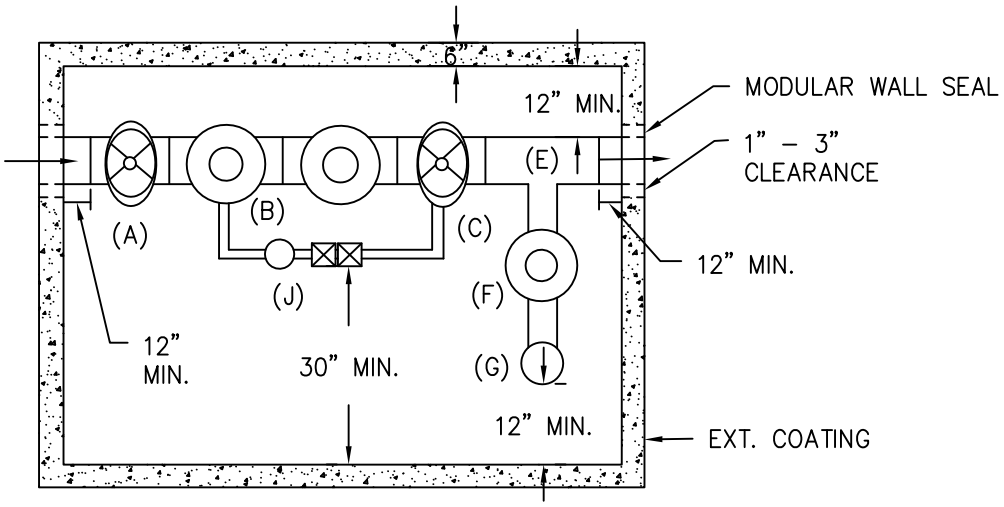
1) ALL JOINTS MUST BE RESTRAINED WITH MJ PIPE RESTRAINTS
2) MAY BE REDUCED TO 24" BETWEEN ADJACENT 1" METER SETTINGS

MARCH 2006

2.2.2-8

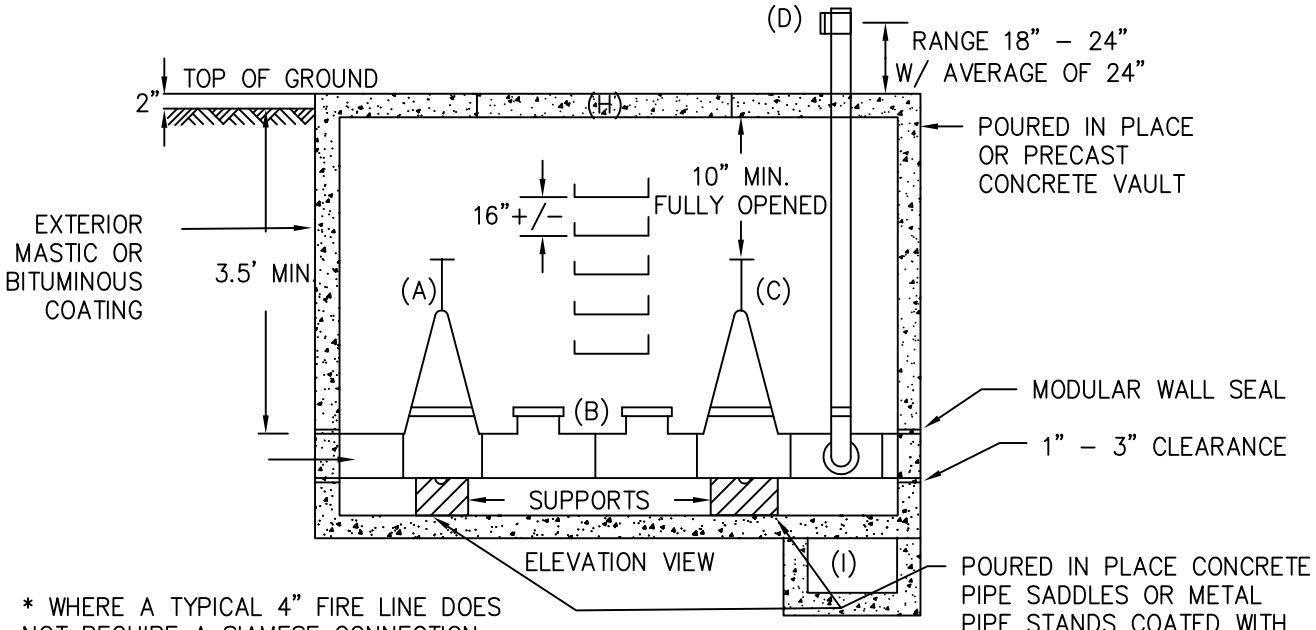
STAFFORD COUNTY DEPARTMENT OF UTILITIES

MANIFOLD METER SETTING



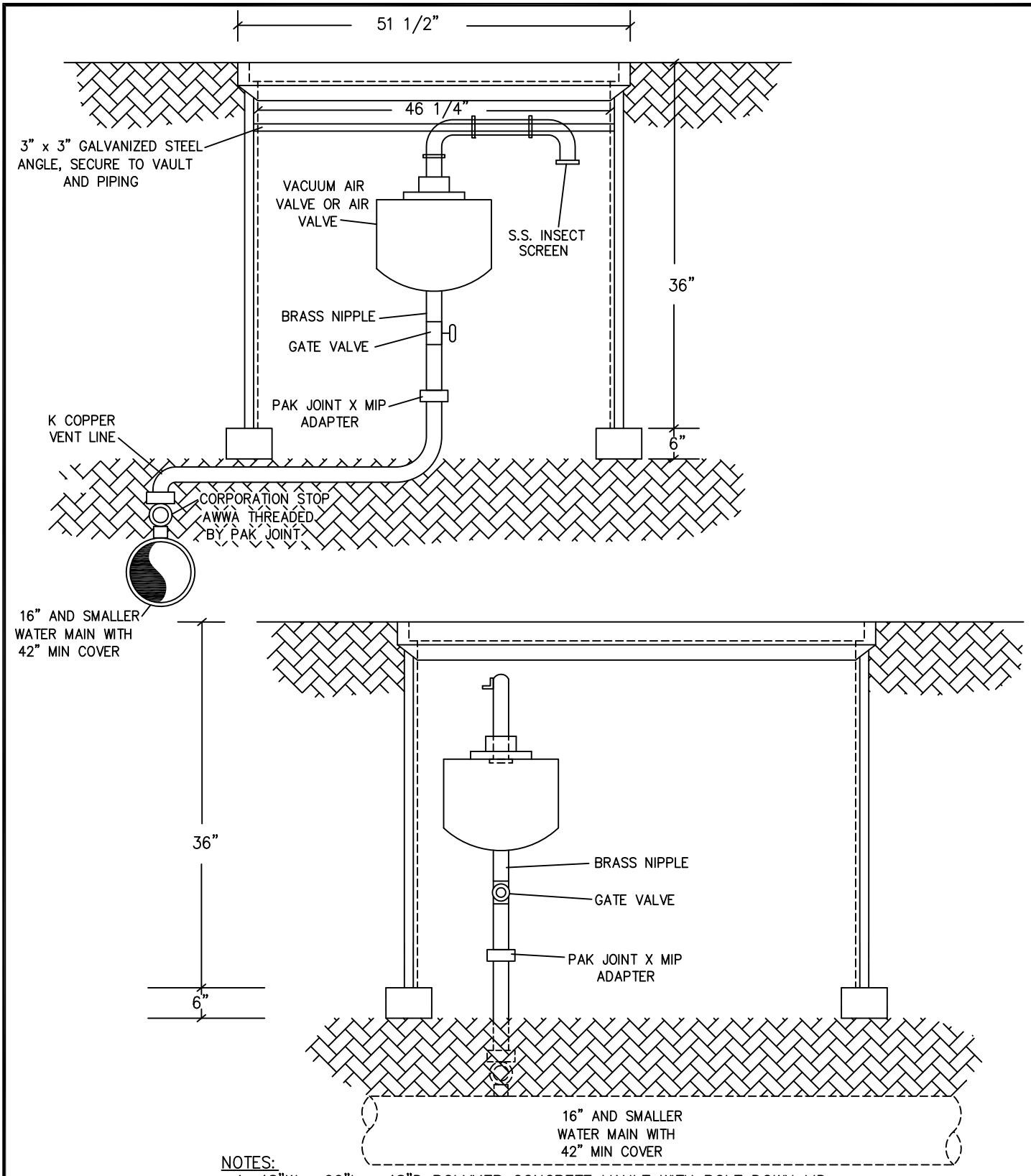
PLAN VIEW

(A) OUTSIDE STEM AND YOKE GATE VALVE
(B) DOUBLE CHECK VALVE ASSEMBLE
(C) OUTSIDE STEM AND YOKE GATE VALVE
*(D) 2½" THREADED N.S.T. SIAMESE CONNECTION FOR FIRE DEPARTMENT W/ AUTOMATIC BALL DRIP
*(E) REQUIRED (MAIN LINE SIZE)" X 4"
*(F) 4" CHECK VALVE
*(G) 4" – 90° BEND
(H) 4' X 6" HATCH DOOR OR APPROVED EQUAL
(I) SUMP: DRAIN TO DAYLIGHT OR FURNISH AND INSTALL PUMP
(J) LOW FLOW BYPASS LINE W/ DETECTOR METER & DOUBLECHECK BACKFLOW PREVENTOR
(K) SUBMIT SHOP DRAWINGS TO DEPARTMENT OF UTILITIES FOR APPROVAL



* WHERE A TYPICAL 4" FIRE LINE DOES NOT REQUIRE A SIAMESE CONNECTION, ITEMS (D) THRU (G) DO NOT APPLY.

DECEMBER 2004	2.2.3–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	DOUBLE CHECK ASSEMBLY AND VAULT – 4" & LARGER

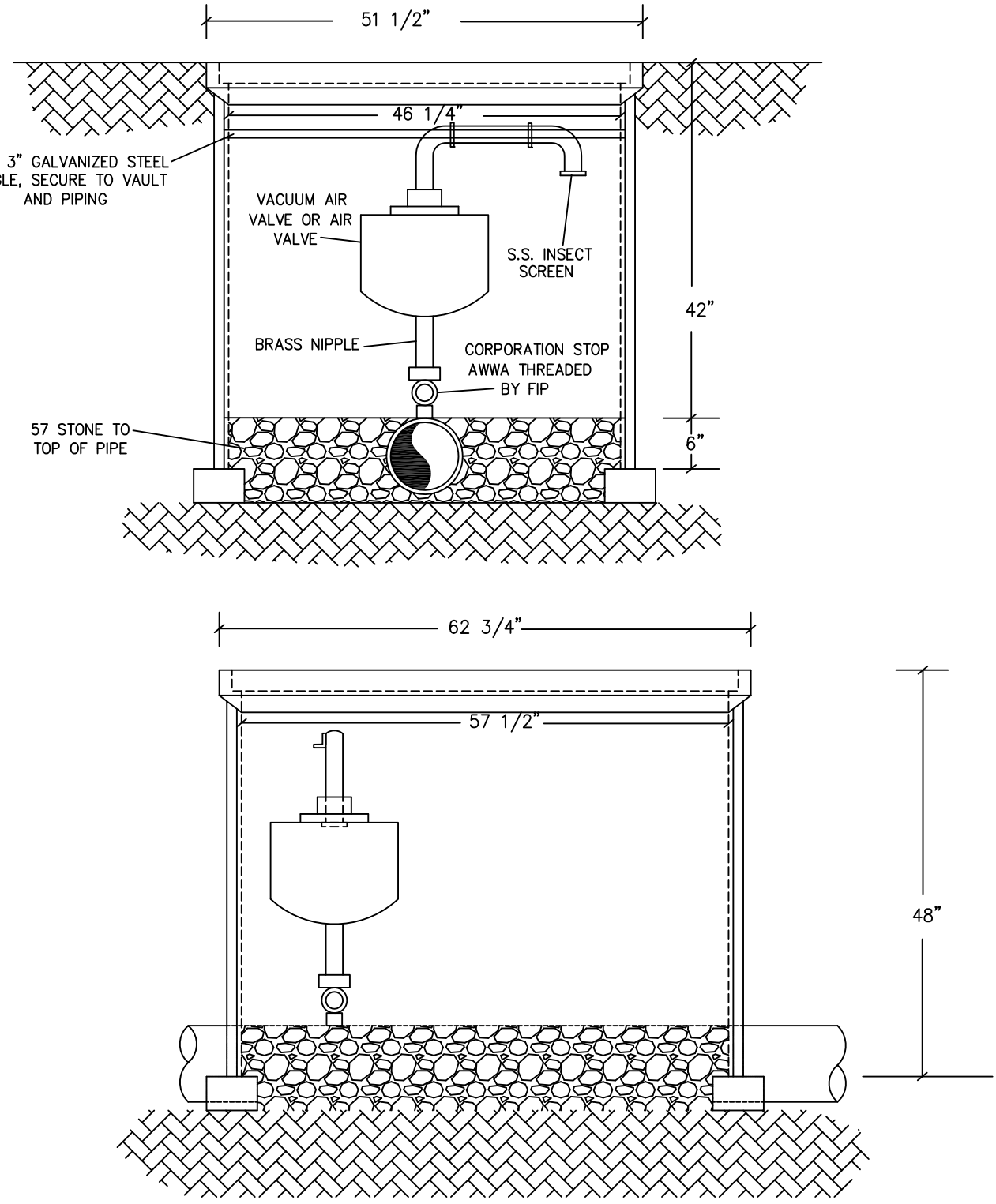


NOTES:

1. 48"W x 60"L x 48"D POLYMER CONCRETE VAULT WITH BOLT DOWN LID. DRILL 4 – 1" DIA. HOLES IN LID.
2. USE FOR 1"DIA. OR 2"DIA. VALVES AND PIPING, 2" VALVES AND PIPING ILLUSTRATED.
3. ALL FITTINGS TO BE BRASS IPS THREADED.
4. DIRECT TAP TO DIP OR C900 DR14, OTHERWISE SADDLE REQUIRED.
5. SLOPE VENT LINE CONTINOUSLY UP TO VALVE.
6. FOR DRY LOCATIONS.

NOVEMBER 2016	2.3.1–1

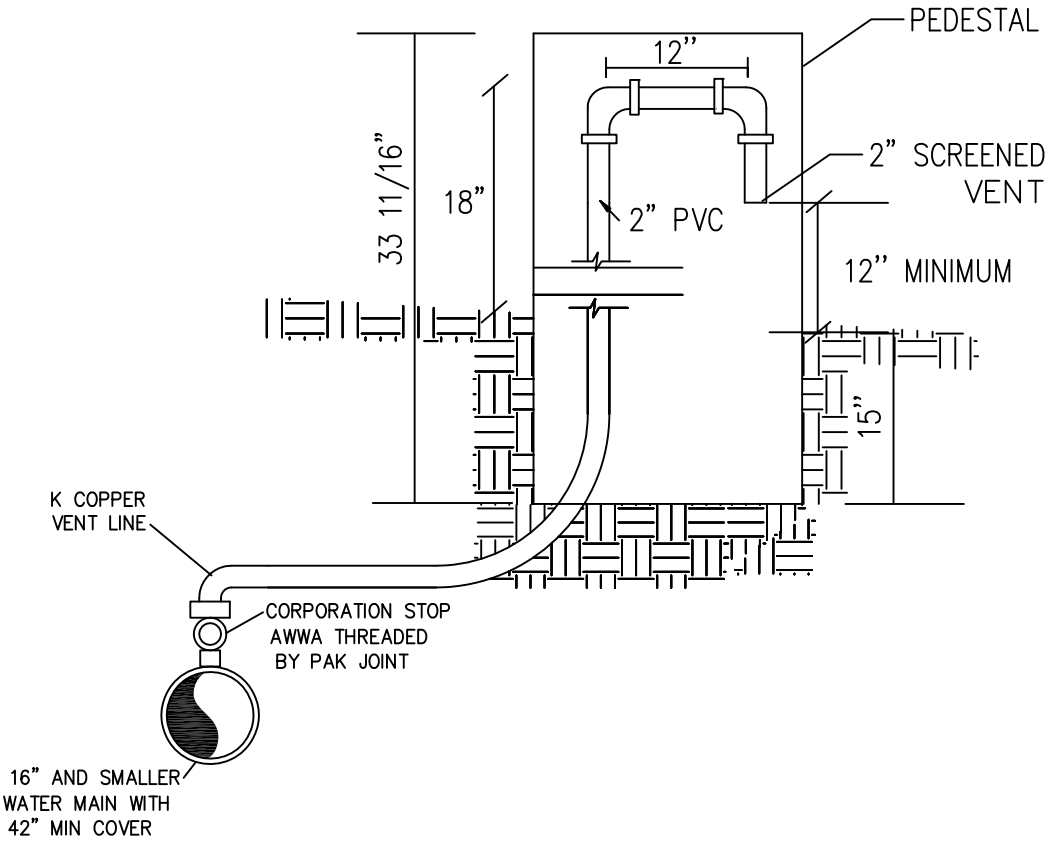
STAFFORD COUNTY DEPARTMENT OF UTILITIES	VACUUM AIR RELEASE OR AIR RELEASE 2" AND SMALLER OFF PIPE LOCATION DRY LOCATIONS

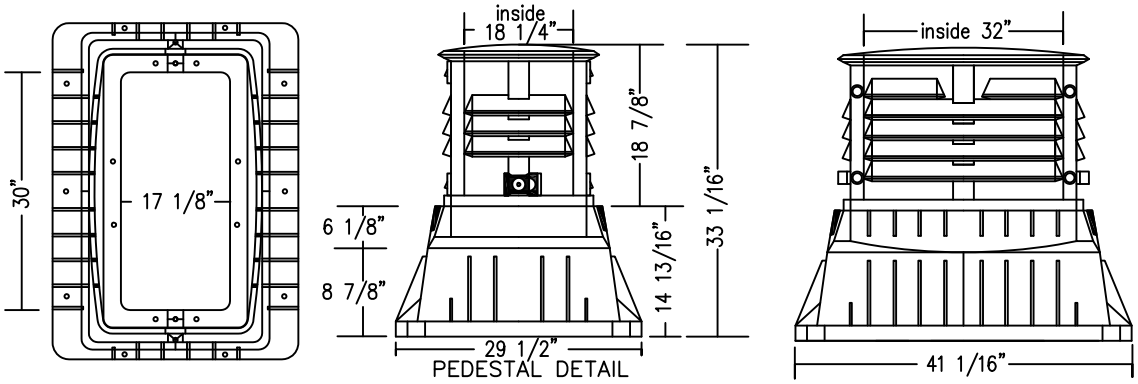


NOTES:

1. 48"W x 60"L x 48"D POLYMER CONCRETE VAULT WITH BOLT DOWN LID. DRILL 4 – 1" DIA. HOLES IN LID.
2. USE FOR 1"DIA. OR 2"DIA. VALVES AND PIPING, 2" VALVES AND PIPING ILLUSTRATED.
3. ALL FITTINGS TO BE BRASS IPS THREADED.
4. DIRECT TAP TO DIP OR C900 DR14, OTHERWISE SADDLE REQUIRED.
5. FOR DRY LOCATIONS.

NOVEMBER 2016	2.3.1–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	VACUUM AIR RELEASE OR AIR RELEASE 2" AND SMALLER ON PIPE LOCATION DRY LOCATIONS





1. USE FOR 1"DIA. OR 2"DIA. VALVES AND PIPING, 2" VALVES AND PIPING ILLUSTRATED.
2. ALL FITTINGS TO BE BRASS IPS THREADED.
3. DIRECT TAP TO DIP OR C900 DR14, OTHERWISE SADDLE REQUIRED.
4. SLOPE VENT LINE CONTINUOSLY UP TO VALVE.
5. FOR WET LOCATIONS.

OCTOBER 2016	2.3.1–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	VACUUM AIR RELEASE OR AIR RELEASE 2" AND SMALLER OFF PIPE LOCATION WET LOCATIONS

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

DIRECT BURY VACUUM-AIR RELEASE
VALVE OFF-PIPE INSTALLATION
FOR WET LOCATIONS

SEPT 2016

2.3.1-4

C.I. FRAME & COVER
MARKED "WATER"
BOLTED TO RINGS

2 - 3" REINFORCED
CONC. ADJUSTING
RINGS

24" ID

2" NPT TO 2" NPT
ADAPTER WITH
2" COMPRESSION
FITTING

12"

30"

6"

#57 VDOT STONE

2" PE (ASTM D3035)

* FACE PEDESTAL TOWARD STREET
DETAIL ROTATED FOR CLARITY.

33 11/16"

18"

2" PVC

12"

15"

12" MINIMUM

2" SCREENED
VENT

PEDESTAL

2" TYPE "K" COPPER
LAY PIPE UPGRADE
OF MAIN TO PREVENT
TRAPPING OF AIR

WATER MAIN

2" CORP. STOP

30"

17 1/8"

6 1/8"

8 7/8"

29 1/2"

PEDESTAL DETAIL

inside
18 1/4"

18 7/8"

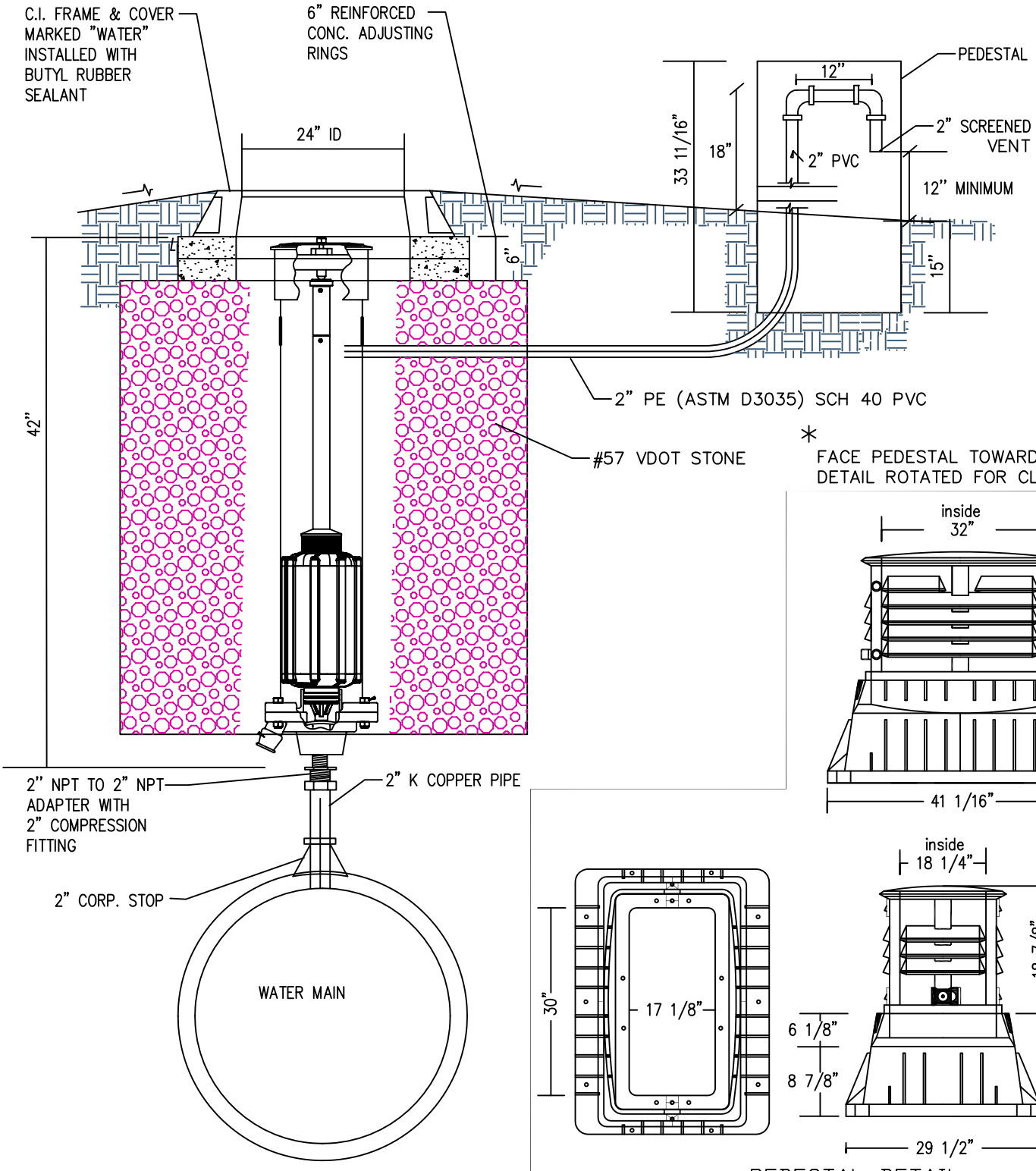
14 13/16"

33 1/16"

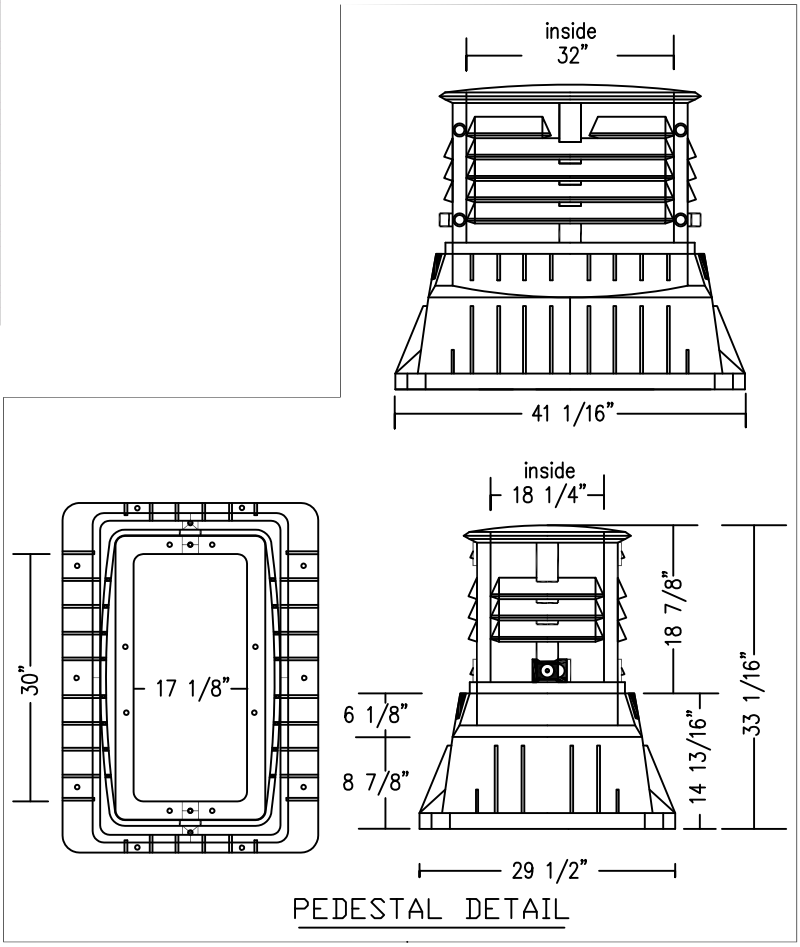
41 1/16"

inside 32"

AUTOMATIC AIR AND VACUUM VALVE
ASSEMBLY W/ 2" FNPT BASE



* FACE PEDESTAL TOWARD STREET
DETAIL ROTATED FOR CLARITY.



PEDESTAL DETAIL

OCTOBER 2016	Not to Scale	2.3.1–5

STAFFORD COUNTY DEPARTMENT OF UTILITIES

DIRECT BURY VACUUM AIR RELEASE VALVE ON–PIPE INSTALLATION FOR WET LOCATIONS

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

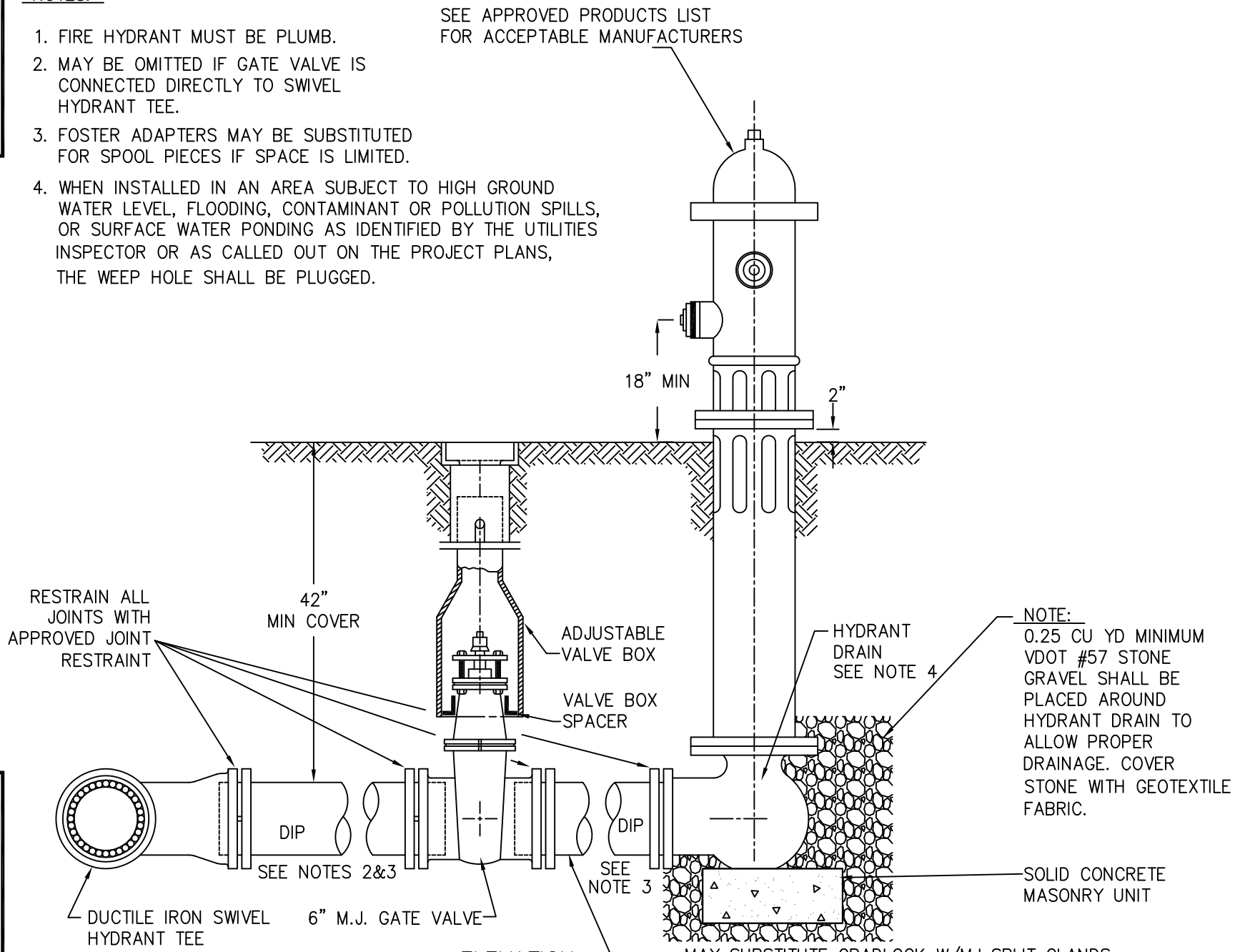
NOVEMBER 2016

TYPICAL
FIRE HYDRANT ASSEMBLY

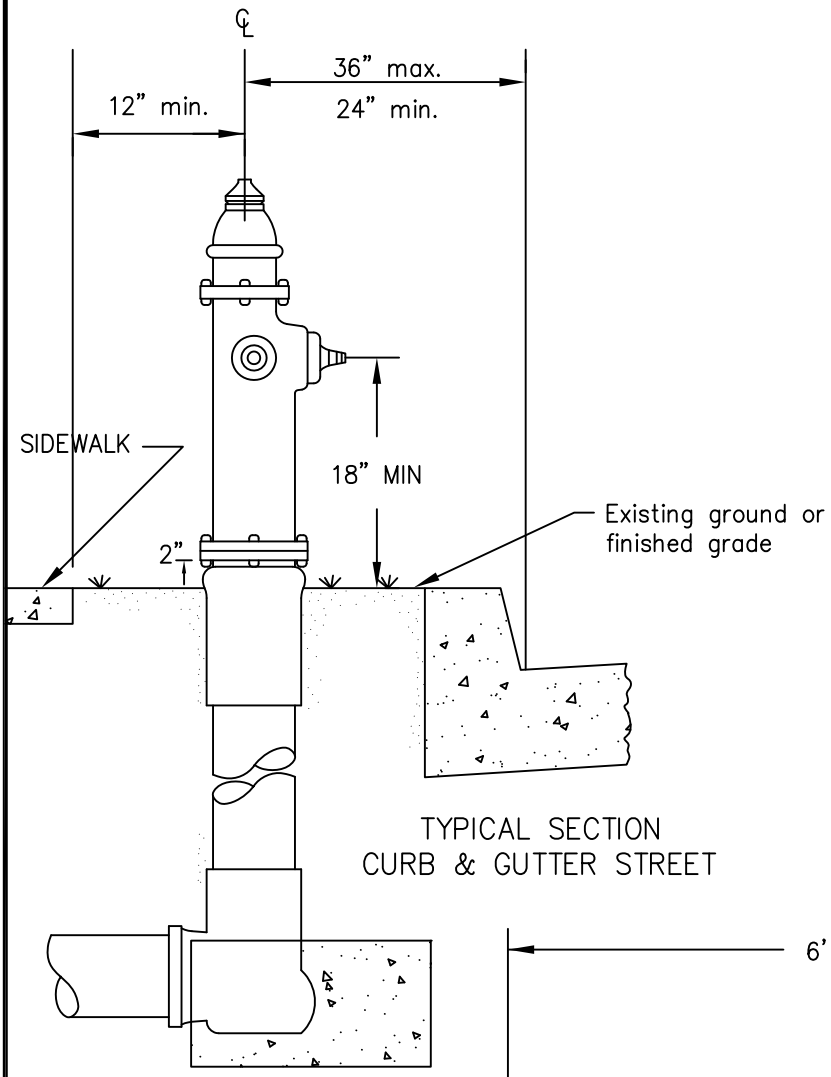
2.4.4-1

NOTES:

1. FIRE HYDRANT MUST BE PLUMB.
2. MAY BE OMITTED IF GATE VALVE IS CONNECTED DIRECTLY TO SWIVEL HYDRANT TEE.
3. FOSTER ADAPTERS MAY BE SUBSTITUTED FOR SPOOL PIECES IF SPACE IS LIMITED.
4. WHEN INSTALLED IN AN AREA SUBJECT TO HIGH GROUND WATER LEVEL, FLOODING, CONTAMINANT OR POLLUTION SPILLS, OR SURFACE WATER PONDING AS IDENTIFIED BY THE UTILITIES INSPECTOR OR AS CALLED OUT ON THE PROJECT PLANS, THE WEEP HOLE SHALL BE PLUGGED.

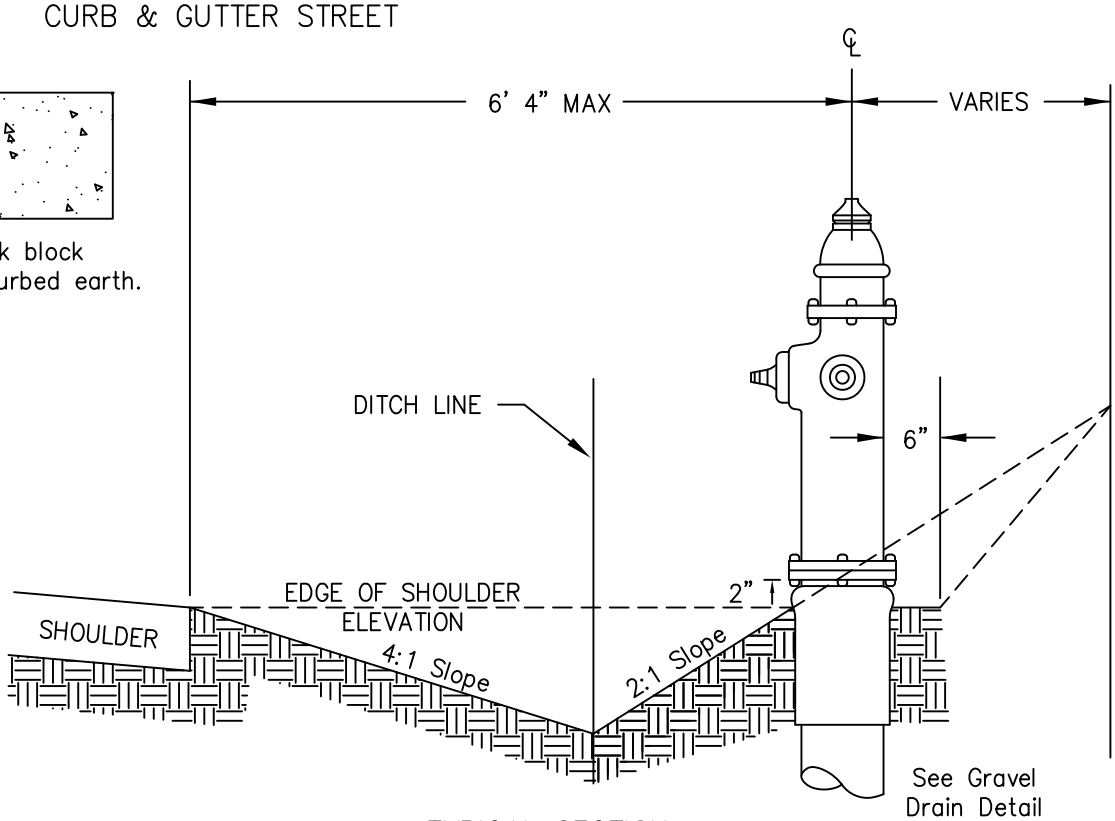


ELEVATION



TYPICAL SECTION
CURB & GUTTER STREET

Concrete support & kick block
to be carried to undisturbed earth.



See Gravel
Drain Detail
ON 2.4.4-1

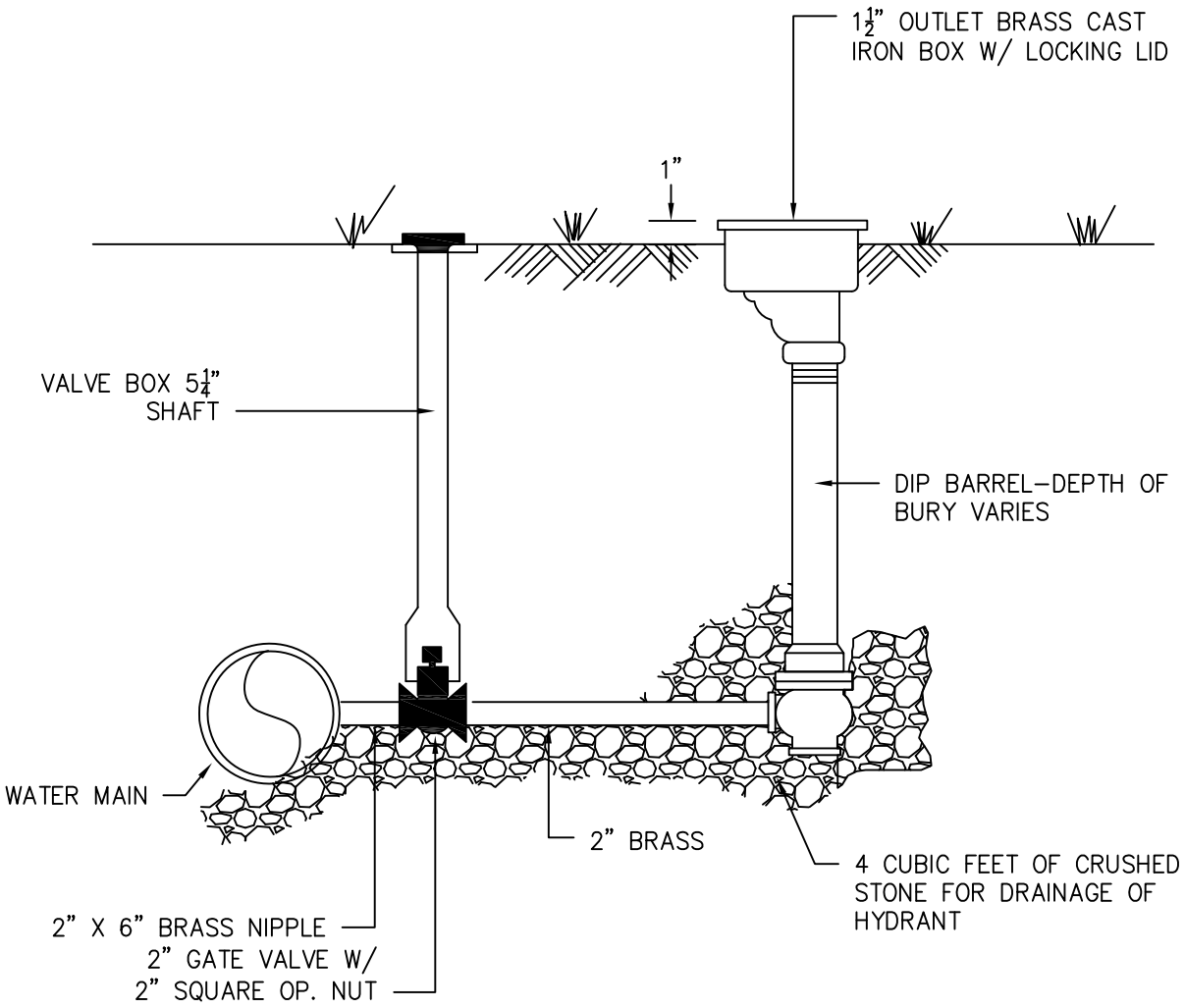
TYPICAL SECTION
STREET WITHOUT CURB & GUTTER

DECEMBER 2004

2.4.4-2

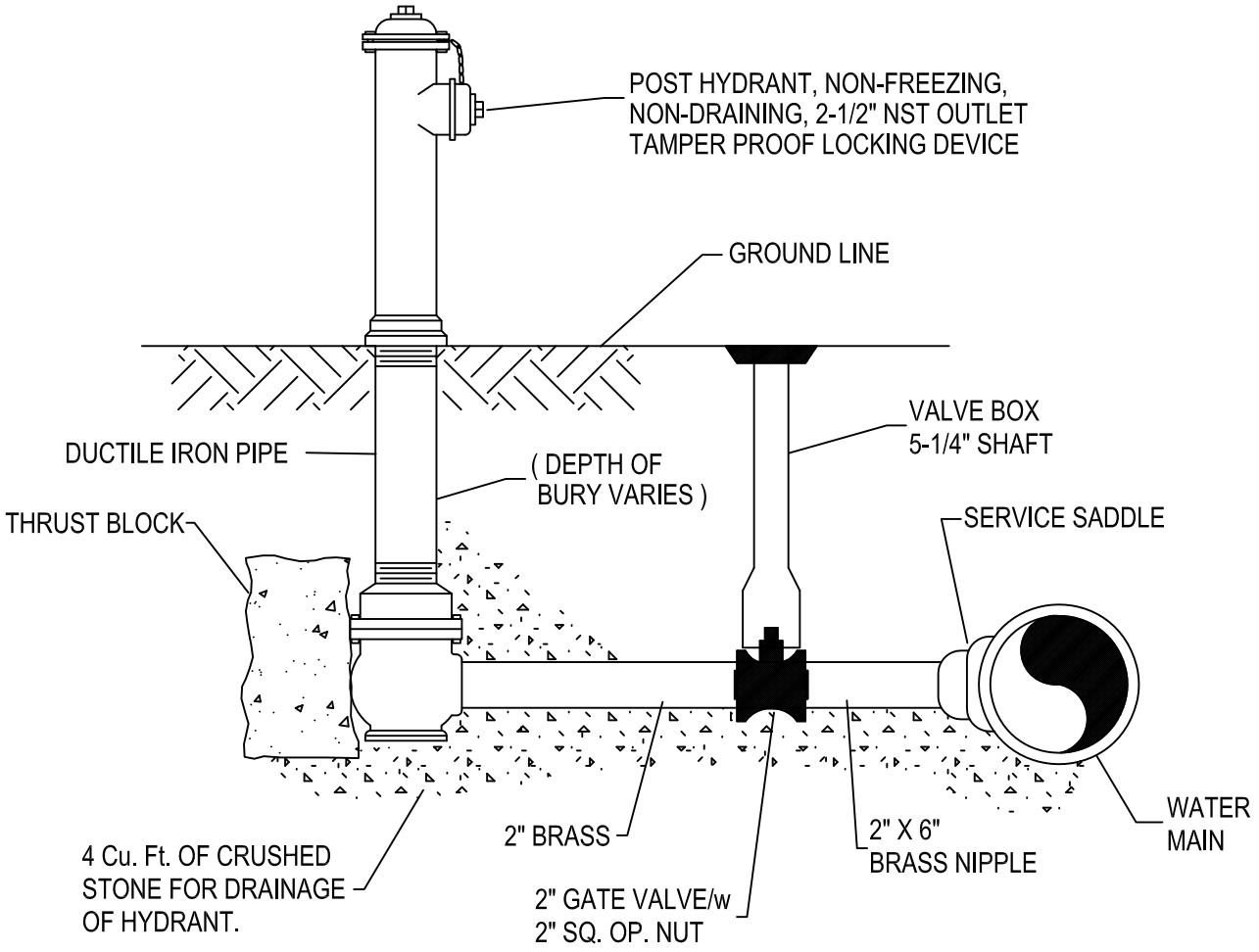
STAFFORD COUNTY
DEPARTMENT OF UTILITIES

TYPICAL FIRE HYDRANT
LOCATION



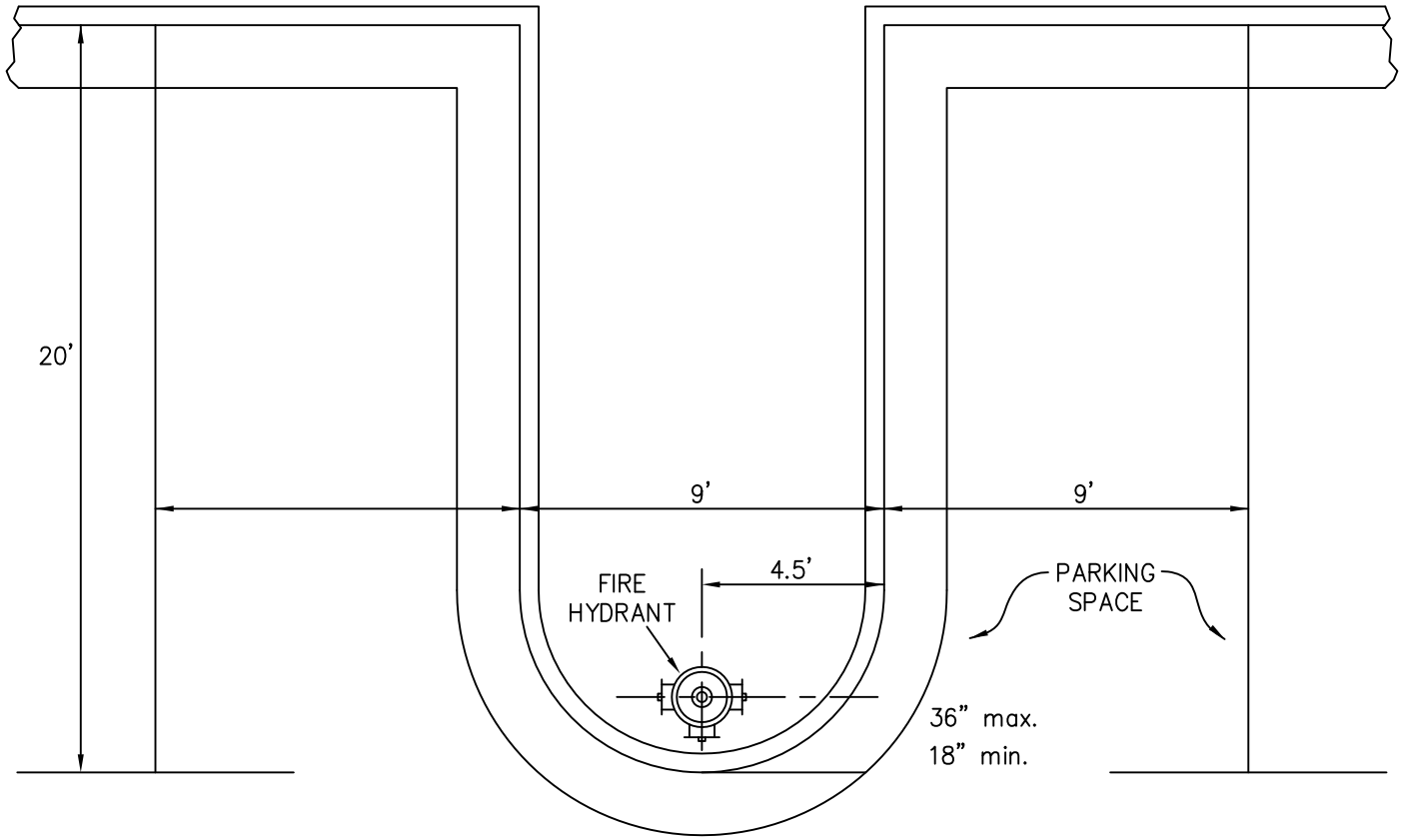
1. FOR DEAD END LINES INSTALL FLUSHING HYDRANT ON RESTRAINED END CAP.

DECEMBER 2004	2.4.4–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	BELOW GRADE FLUSHING HYDRANT



1. FOR DEAD END LINES DELETE SERVICE SADDLE AND INSTALL FLUSHING HYDRANT ON RESTRAINED END CAP

DECEMBER 2004	2.4.4–4
STAFFORD COUNTY DEPARTMENT OF UTILITIES	ABOVE GRADE FLUSHING HYDRANT

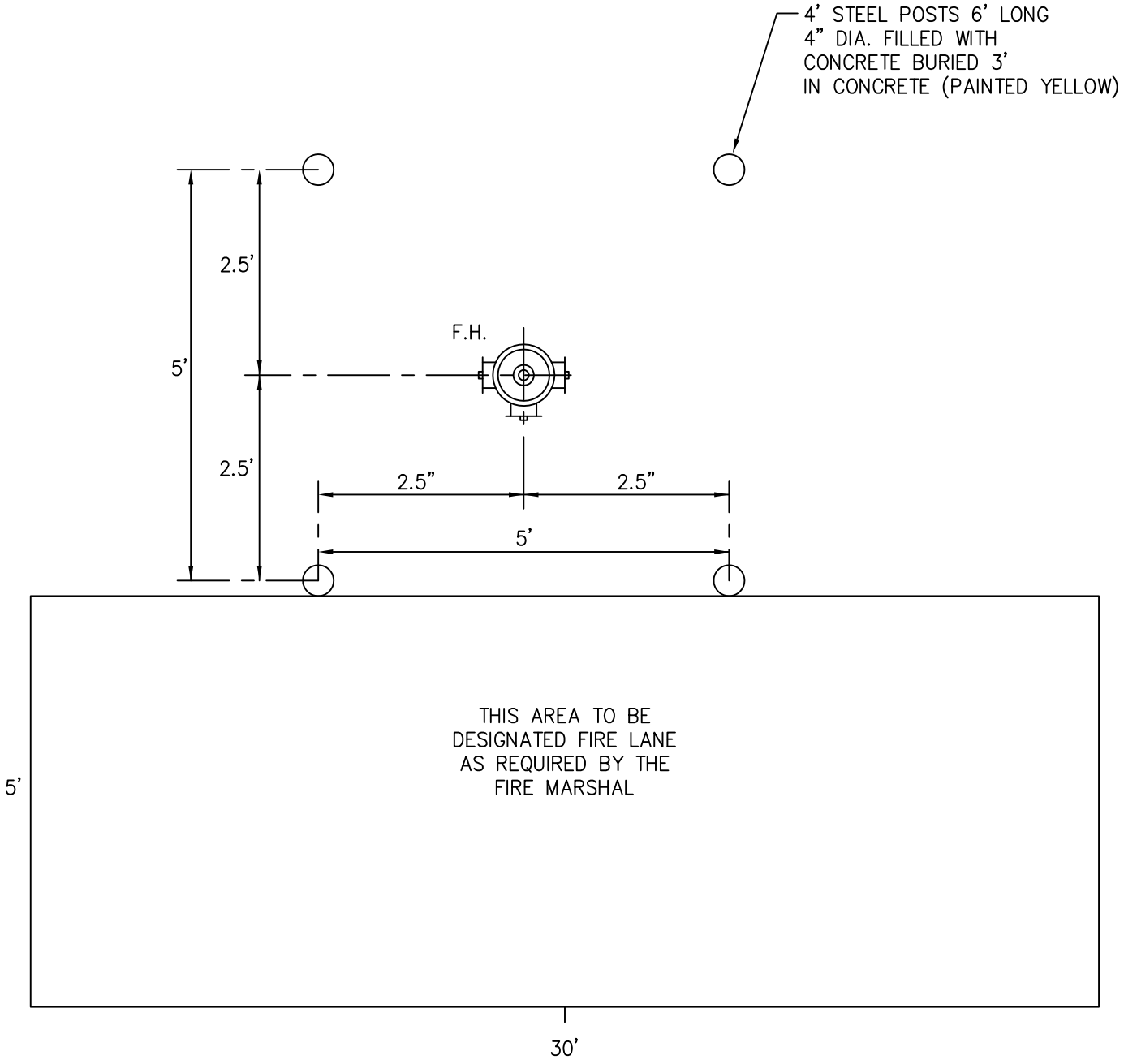


DECEMBER 2004

2.4.4–6

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

TYPICAL FIRE HYDRANT
LOCATION IN ISLAND & PARKING AREA

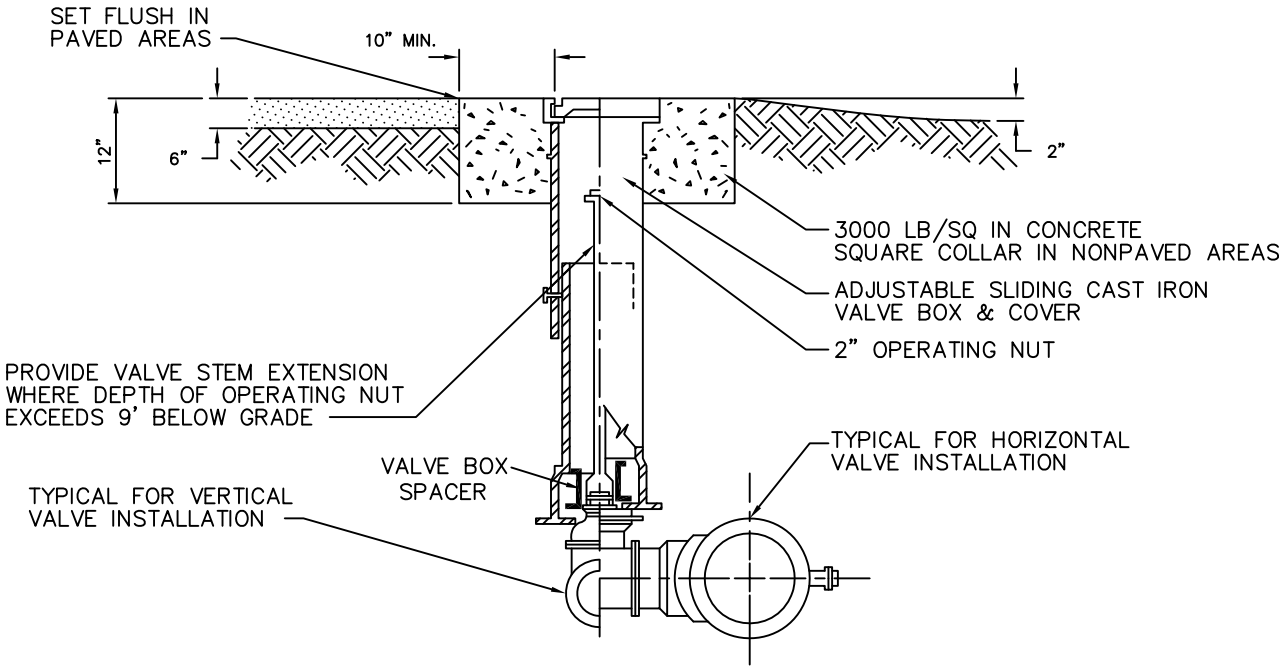


DECEMBER 2004

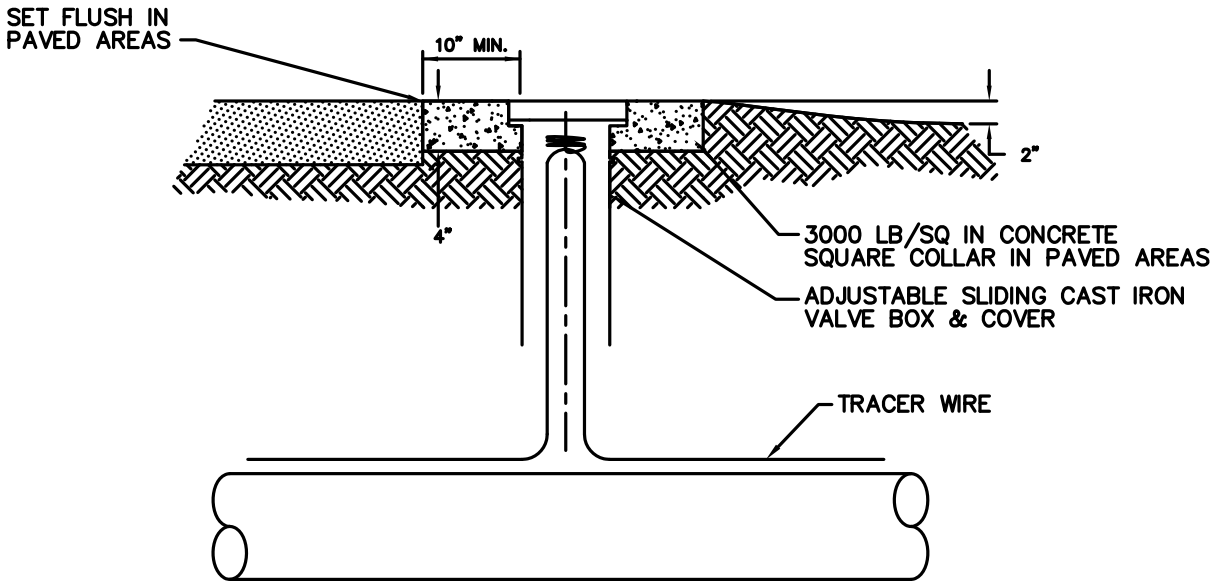
2.4.4–7

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

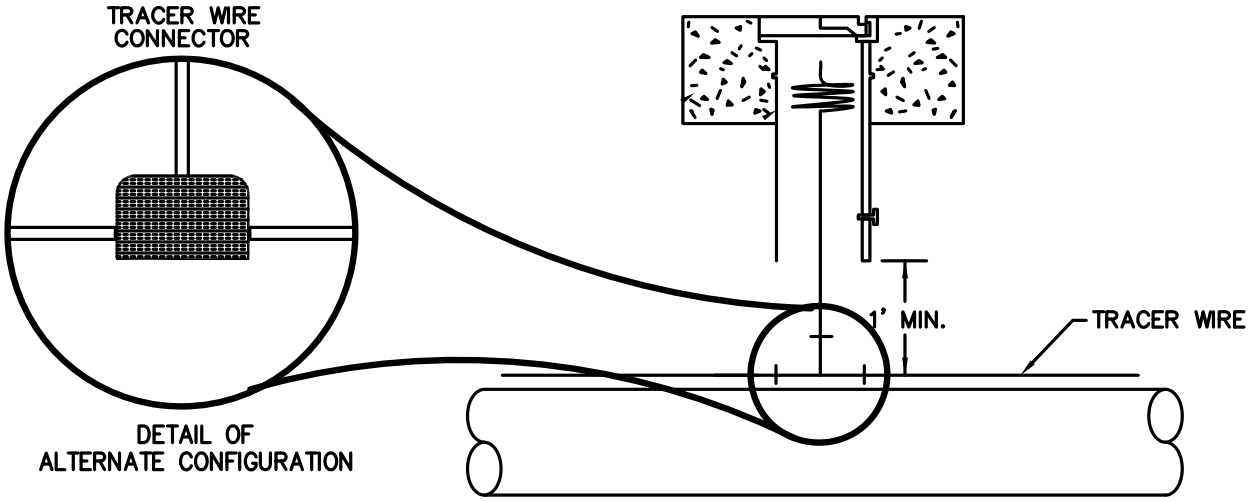
TYPICAL FIRE HYDRANT
POST PROTECTION



SEPT 2016	2.4.5–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TYPICAL VALVE AND VALVE BOX



PREFERRED CONFIGURATION



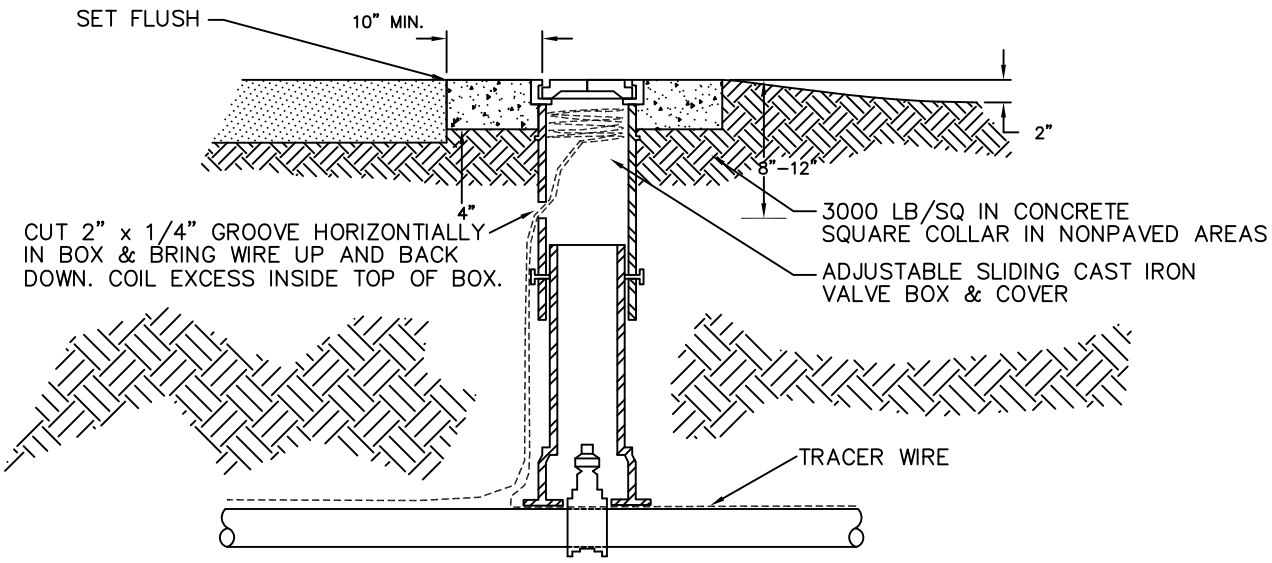
DETAIL OF
ALTERNATE CONFIGURATION

ALTERNATE CONNECTION CONFIGURATION
WITH DEPARTMENT APPROVAL ONLY

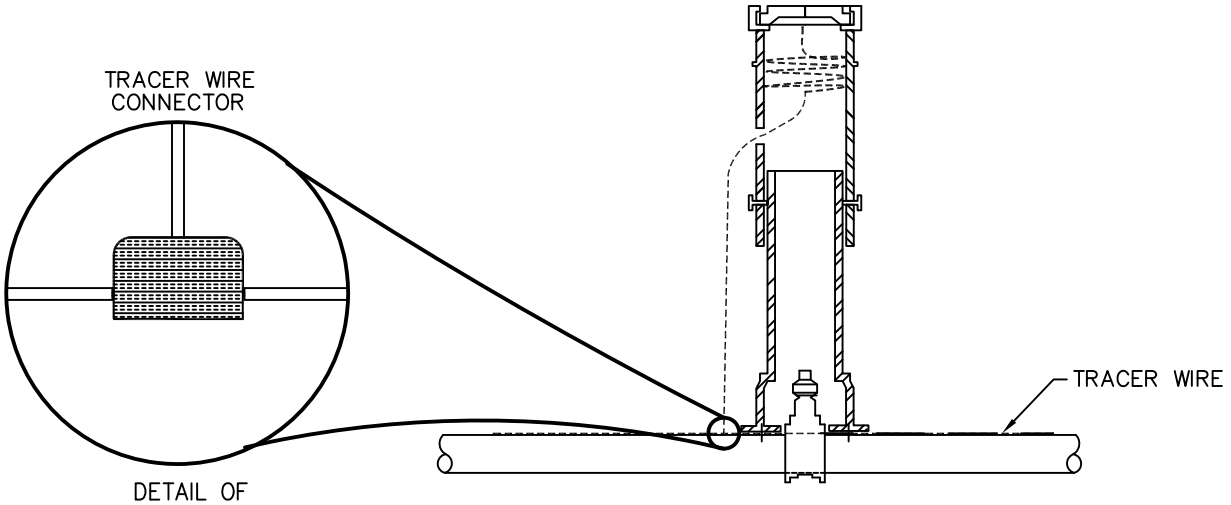
NOTES:

1. MAXIMUM TRACER WIRE BOX SPACING, 300 FEET.
2. TRACER WIRE, 10 GAUGE COPPER CLAD STEEL CORE HDPE INSULATED.
3. CONNECTED WITH APPROVED TRACER WIRE CONNECTOR FOR ALTERNATE CONFIGURATION.
4. PROVIDE SUFFICIENT TRACER WIRE TO EXTEND 3 FEET BEYOND THE VALVE BOX COVER. COIL UP WIRE AND PLACE UNDER COVER.
5. ATTACH TRACER WIRE TO PIPE EVERY 10 FEET WITH DUCT TAPE.
6. COUNTY MAY TEST TRACER WIRE FOR CONTINUITY PRIOR TO ACCEPTANCE.

MARCH 2016	2.4.5–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TRACER WIRE LOCATOR BOX



PREFERRED CONFIGURATION



DETAIL OF ALTERNATE CONFIGURATION

ALTERNATE CONNECTION CONFIGURATION WITH DEPARTMENT APPROVAL ONLY

NOTES:

1. MAXIMUM TRACER WIRE BOX SPACING, 300 FEET.
2. TRACER WIRE, 10 GAUGE COPPER CLAD STEEL CORE HDPE INSULATED.
3. CONNECTED WITH APPROVED TRACER WIRE CONNECTOR FOR ALTERNATE CONFIGURATION.
4. PROVIDE SUFFICIENT TRACER WIRE TO EXTEND 3 FEET BEYOND THE VALVE BOX COVER. COIL UP WIRE AND PLACE UNDER COVER.
5. ATTACH TRACER WIRE TO PIPE EVERY 10 FEET WITH DUCT TAPE.
6. COUNTY MAY TEST TRACER WIRE FOR CONTINUITY PRIOR TO ACCEPTANCE.

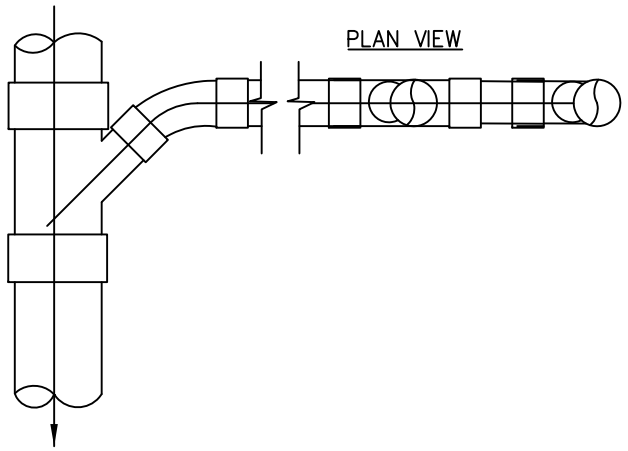
MARCH 2016	2.4.5–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TYPICAL VALVE BOX WITH TRACER WIRE

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

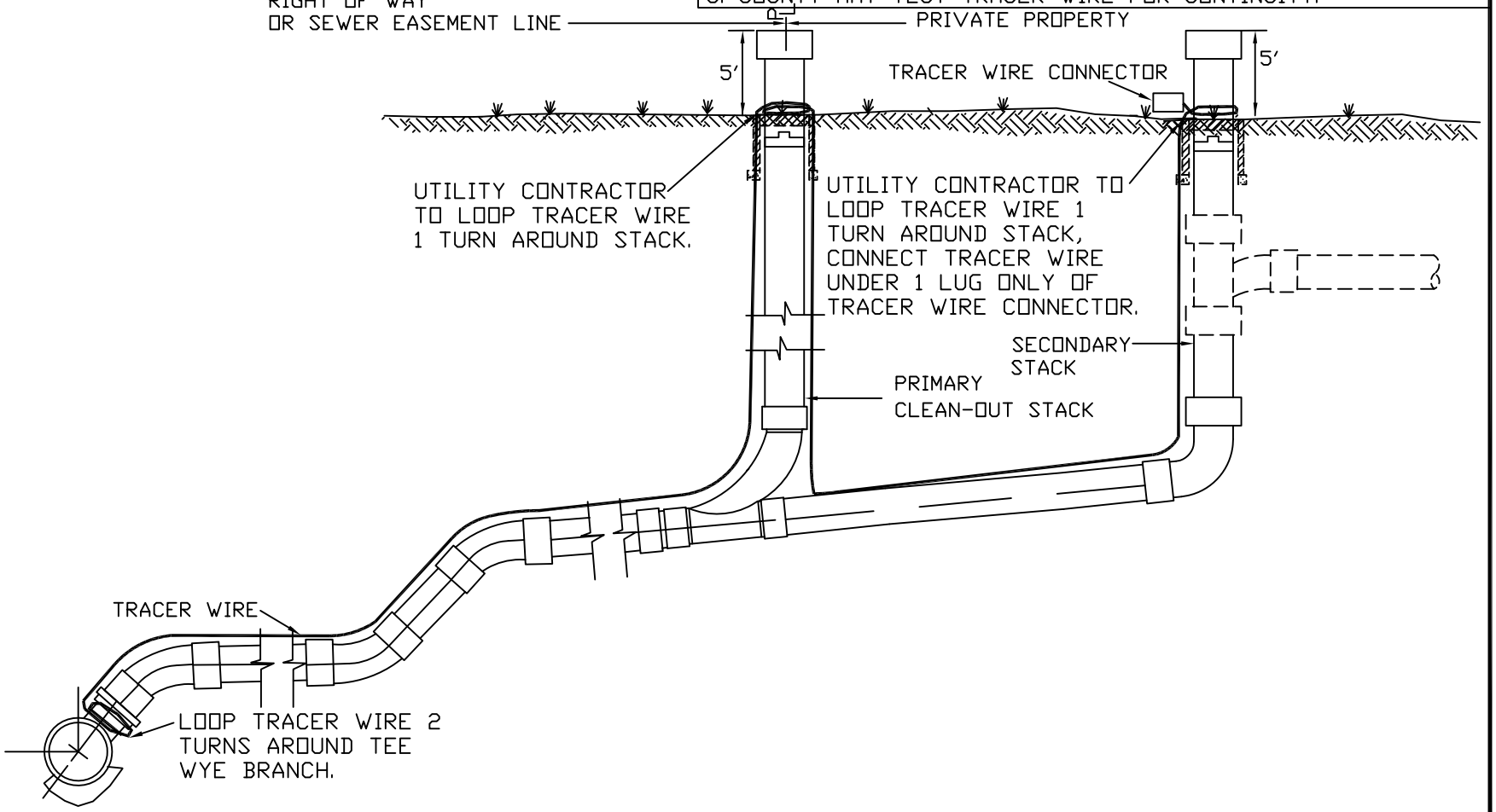
SEPT 2016

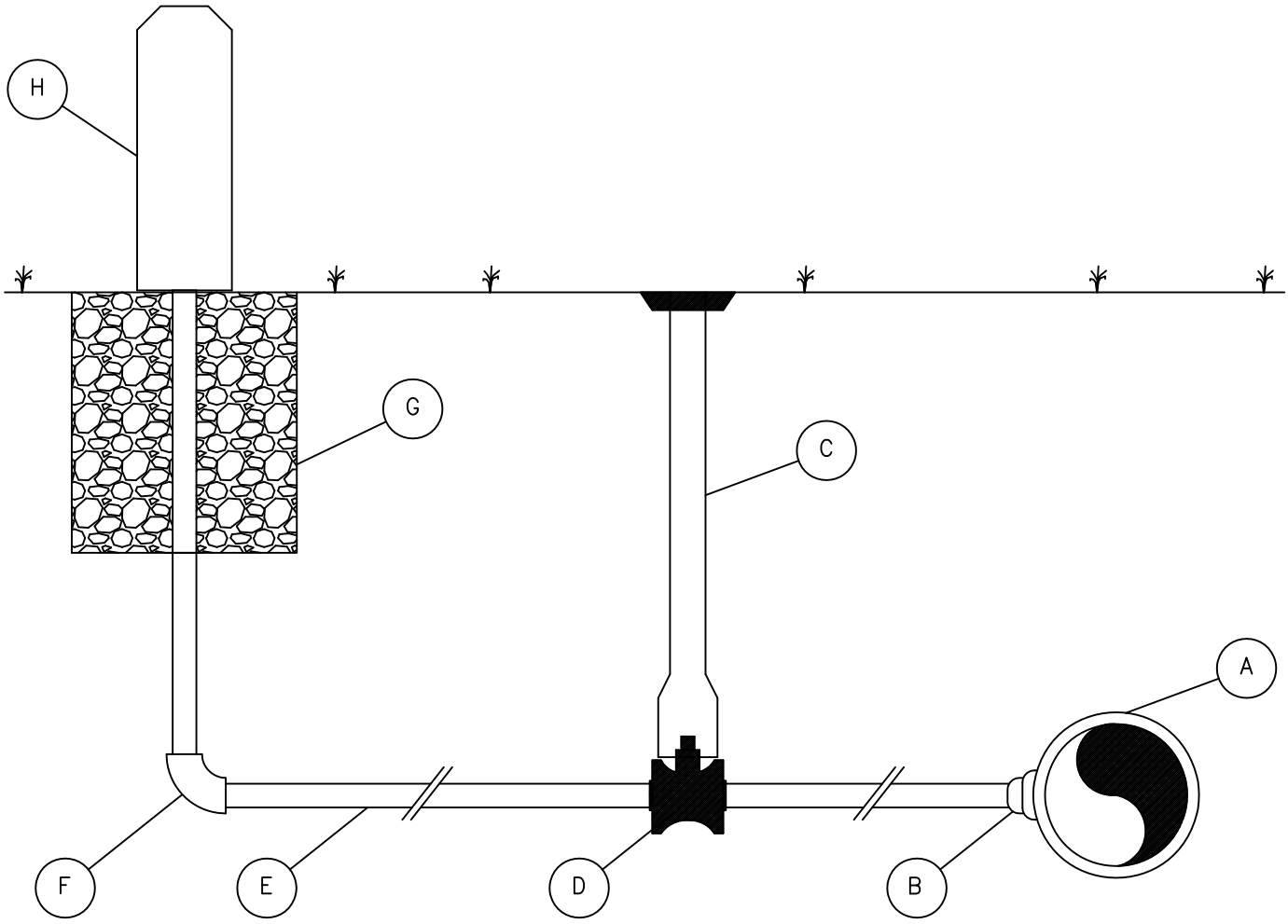
TRACER WIRE FOR SEWER LATERALS

2.4.5–4



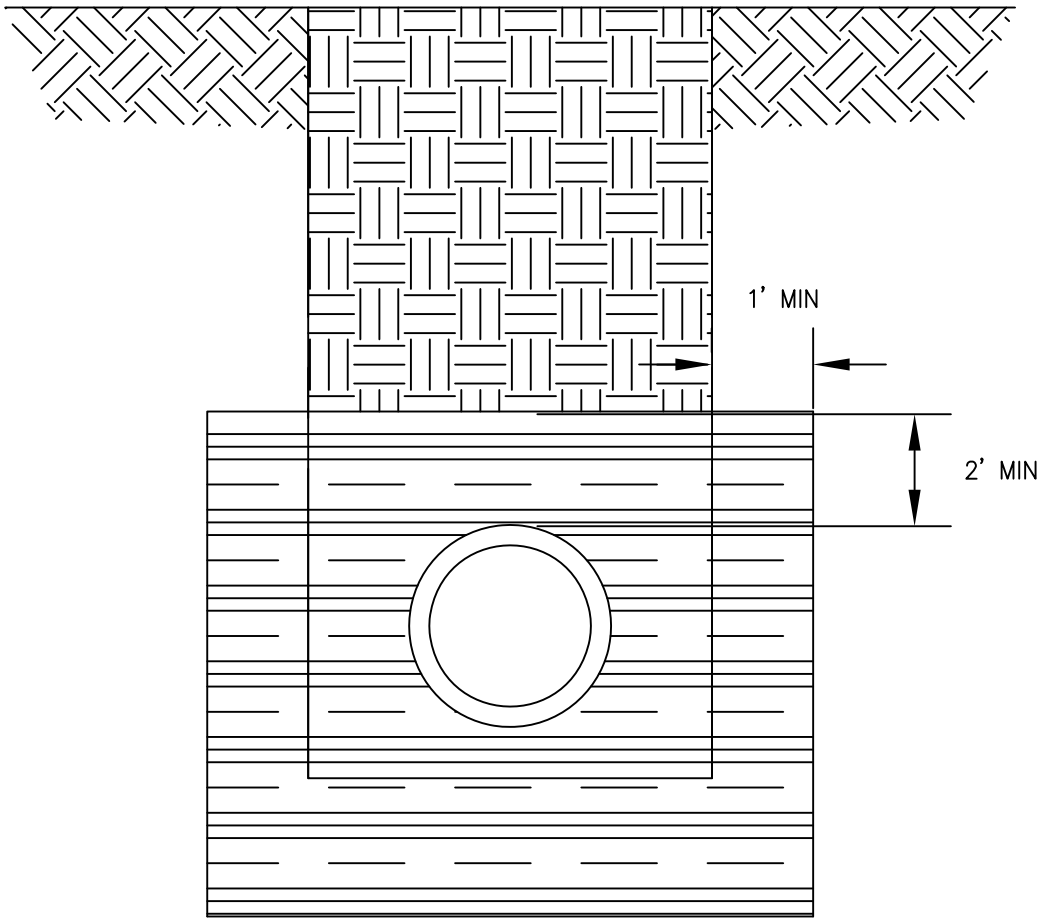
NOTES:
1. ALL SEWER LATERALS SHALL HAVE TRACER WIRE TAPED TO PIPE AND STACKS.
2. UTILITY CONTRACTORS SHALL WRAP TRACER WIRE AROUND BRANCH OF THE WYE, TAPE TO LATERAL AND PRIMARY STACK, CONTINUE TO SECONDARY STACK AND TERMINATE WITH TRACER WIRE CONNECTOR UNDER 1 LUG, LEAVE CONNECTOR UNSEALED, PROTECT WITH PLASTIC BAG AND TAPE TO STACK.
3. PLUMBER SHALL MOVE MOST OF TRACER WIRE TO SAND BETWEEN STACK AND CLEANOUT COVER; LEAVE 6" OF WIRE EXPOSED IN CLEANOUT COVER.
4. PLUMBER SHALL DETACH TRACER WIRE AS NECESSARY FROM SECONDARY STACK OR STRAIGHT PIPE BEYOND PRIMARY STACK, ATTACH TRACER WIRE TO UNUSED LUG OF TRACER WIRE CONNECTOR, SEAL TRACER WIRE CONNECTOR AND EXTEND TRACER WIRE ALONG SEWER LATERAL TO STRUCTURE IN ACCORDANCE WITH 703.6 OF THE VIRGINIA PLUMBING CODE.
5. COUNTY MAY TEST TRACER WIRE FOR CONTINUITY.





SAMPLING STATION

A. SERVICE SADDLE
B. 3/4" CORPORATION STOP
C. VALVE BOX WITH 5 1/4" C.I. SHAFT
D. CURB STOP VALVE
E. 3/4" K COPPER
F. ELL
G. 24" X 30" POLYETHYLENE METER BARREL (FILL WITH #57 GRAVEL)
H. SAMPLE STATION
I. SEE APPROVED PRODUCTS LIST FOR ACCEPTABLE MANUFACTURERS



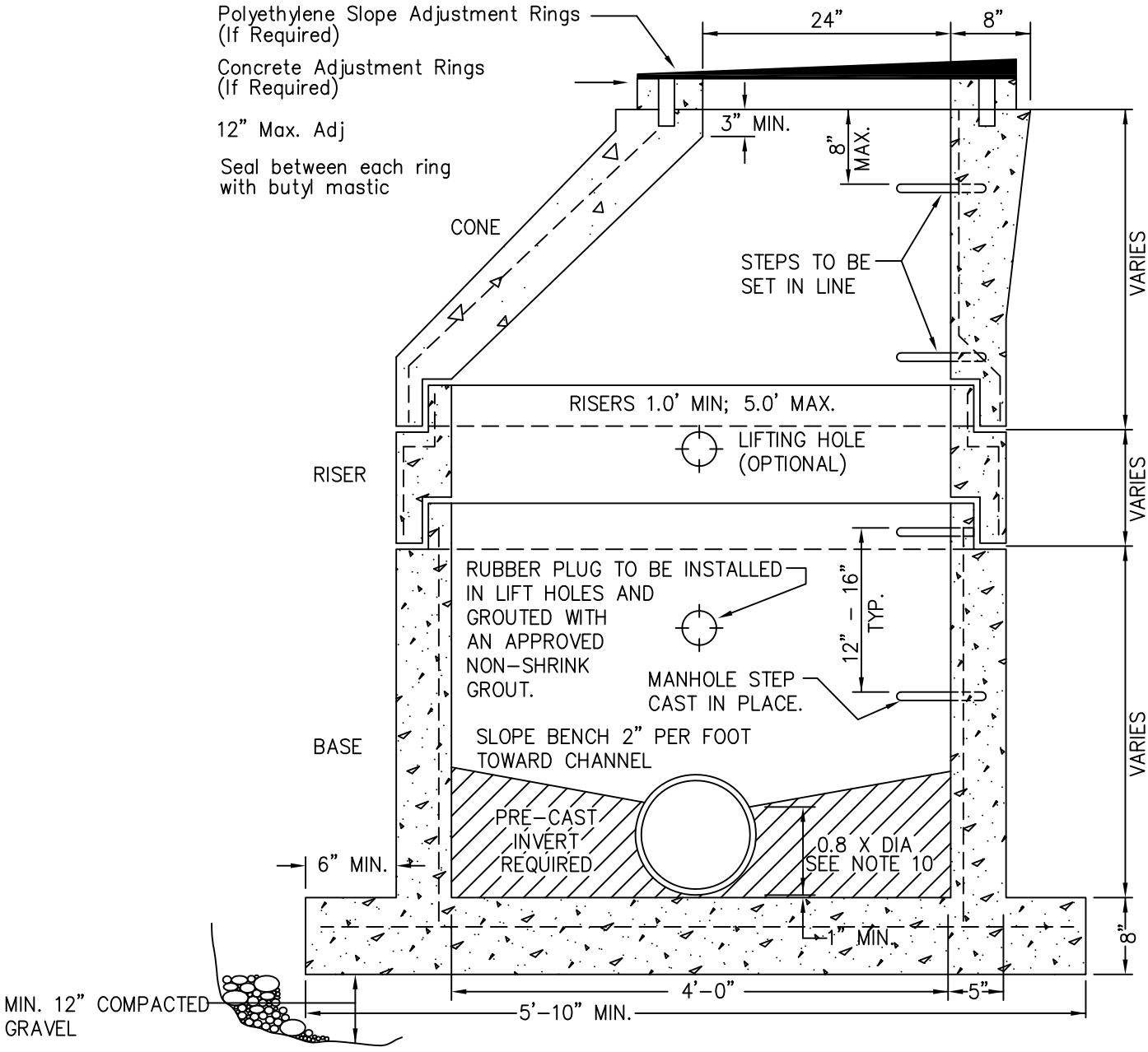
NOTES:

1. NATIVE SOIL USED FOR CLAY DAMS SHALL BE CLASS CL, ML, CH, OR SC, OR SHALL HAVE A VERIFIED IMPERVIOUSNESS OF 0.001 CM/SEC. AS PER ASTM D5084.
2. THE USE OF SOIL CEMENT (270# CEMENT/CU.YD.) OR BENTONITE SLURRY IS ACCEPTABLE IN LIEU OF SUITABLE NATIVE SOIL.
3. ALL MATERIAL TO BE APPROVED BY INSPECTOR PRIOR TO PLACING.
4. CLAY DAM EXTENDS 1 FOOT BELOW BEDDING UNLESS ROCK IS ENCOUNTERED.
5. CLAY DAM TO BE MINIMUM OF 2 FEET THICK.
6. CLAY DAMS TO BE INSTALLED ON EACH REACH OF SEWER GREATER THAN 100 FEET IN LENGTH, 25' UPSTREAM FROM THE DOWNSTREAM MANHOLE.

DECEMBER 2004	3.1.2–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	CLAY DAM DETAIL

NOTES:

1. MANHOLE TO MEET CURRENT REQUIREMENTS OF ASTM SPEC. C–478.
2. ALL REINFORCING STEEL TO MEET CURRENT REQUIREMENTS OF ASTM SPEC. A–615.
3. CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.
4. TAPERED JOINT WITH O–RING GASKET JOINT SEAL TO MEET CURRENT REQUIREMENTS OF ASTM ASTM C–361 & C–443.
5. BUTYL MASTIC OR APPROVED EQUAL SHALL BE USED IN ADDITION TO THE GASKET SPECIFIED.
6. EXTERIOR JOINTS SHALL BE SEALED WITH AN APPROVED MANHOLE JOINT WRAP.
7. APPROVED FLEXIBLE JOINT REQUIRED ON ALL PIPE CONNECTIONS TO MANHOLES. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
8. THE EXTERIOR OF ALL MANHOLES SHALL BE COATED WITH BITUMINOUS MATERIAL APPLIED WITH TWO COAT APPLICATION WITH MIMIMUM 16 DRY MILLS.
9. MANUFACTURER'S NAME TO BE ON THE INSIDE OF CONE.
10. INTERIOR COATING SHALL BE INSTALLED WHERE REQUIRED.
11. FOR CHANGES IN DIRECTION OF 45°–90°, THE DEPTH OF THE BENCH SHALL BE 100% OF THE LARGEST PIPE DIAMETER.



JULY 2016

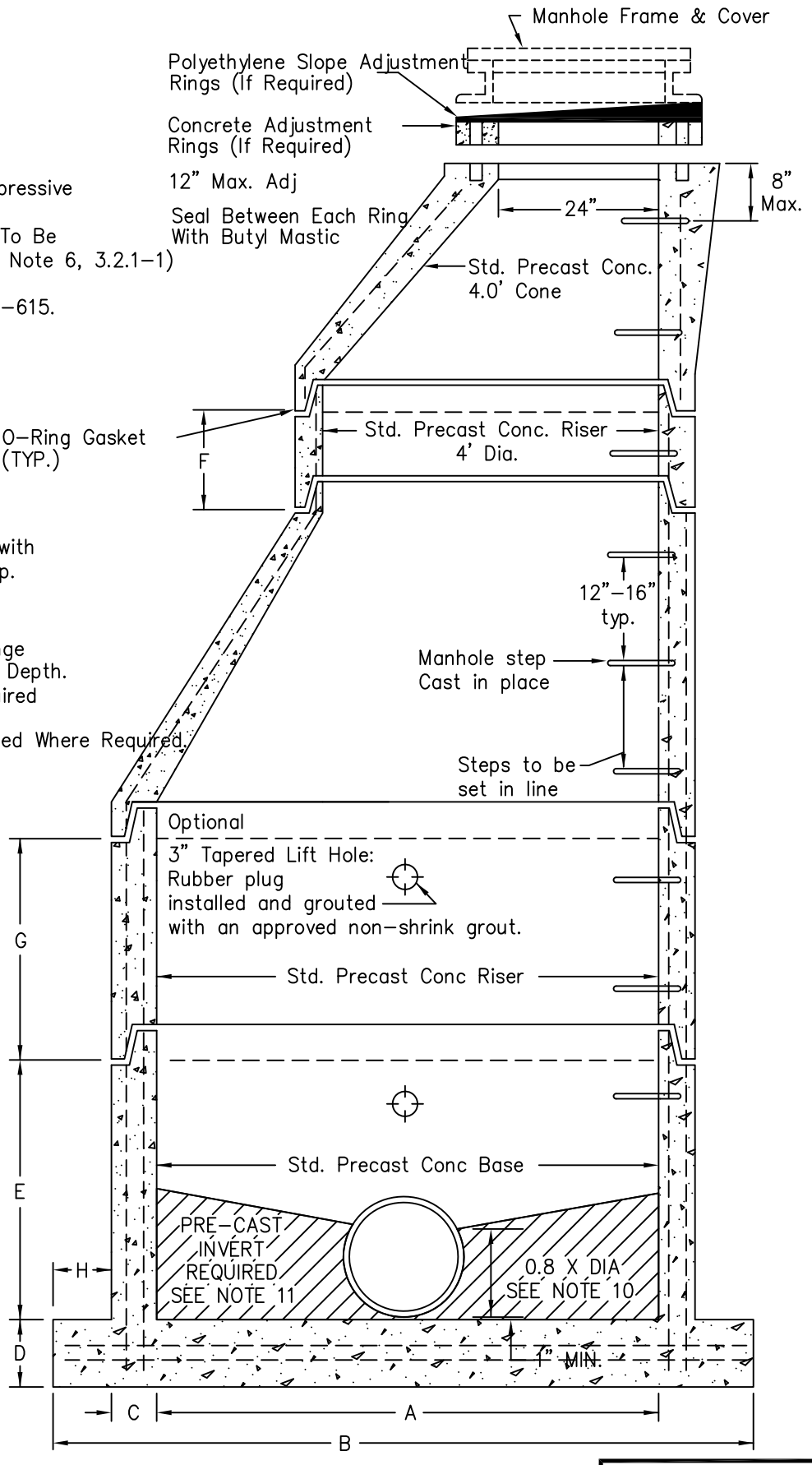
3.2.1–1

STAFFORD COUNTY DEPARTMENT OF UTILITIES

STANDARD 4' I.D. PRECAST CONCRETE MANHOLE

NOTES:

1. Concrete To Be 4000 PSI Compressive Strength, Minimum.
2. Pipe Connections To Manholes To Be Approved Flexible Sleeves. (See Note 6, 3.2.1–1)
3. All Reinforcing To Meet Current Requirements Of ASTM Spec. A–615.
4. Manufacturer's Name To Be On Inside Face Of Cone.
5. Manhole To Meet Current Requirements Of ASTM Spec. C–478.
6. Min. 12" Compacted Gravel Under Base Sections.
7. Joint Configuration May Be Cast Bell–Up Or Spigot–Up.
8. Exterior joints shall be sealed with an approved manhole joint wrap.
9. See Note 5, 3.2.1–1
10. See Note 8, 3.2.1–1
11. Inverts For Manholes With Change Of Direction >45 Shall Be Full Depth.
12. Pre–Cast Inverts Are Not Required For Manhole Diameters >5'.
13. Interior Coating Shall Be Installed Where Required.



Dimensions	Manhole Diameter In Feet	
	5'	6'
A	60"	72"
B	84"	98"
C	6"	7"
D	8"	
E	Varies	
F	13"min.	
G	Varies	
H	6"	6"

OCTOBER 2016

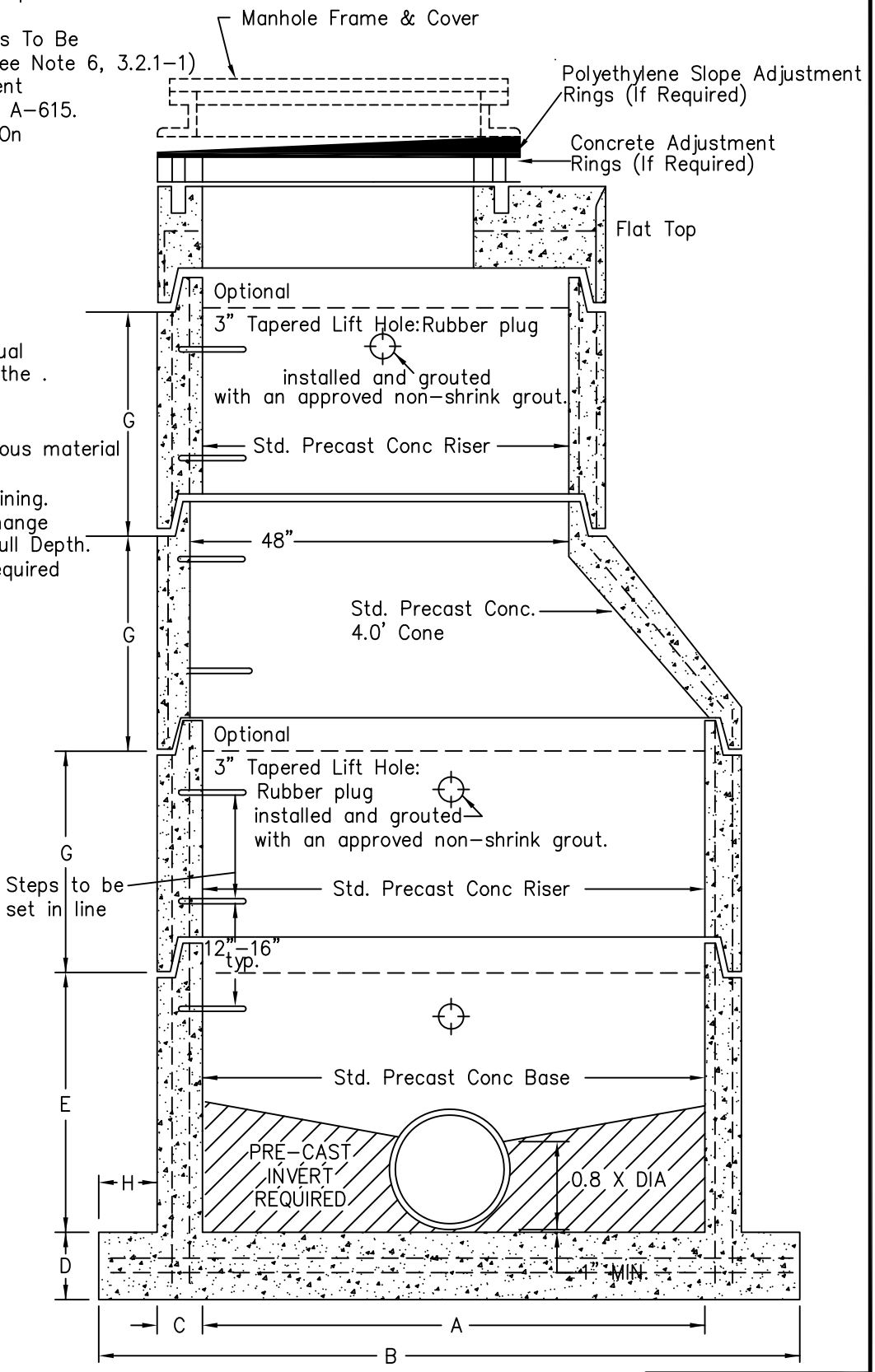
3.2.1–2

STAFFORD COUNTY DEPARTMENT OF UTILITIES

TYPICAL 5' & 6' ID PRECAST CONCRETE MANHOLE W/4' STACK

NOTES:

1. Concrete To Be 5000 PSI Compressive Strength, Minimum.
2. Pipe Connections To Manholes To Be Approved Flexible Sleeves. (See Note 6, 3.2.1–1)
3. All Reinforcing To Meet Current Requirements Of ASTM Spec. A–615.
4. Manufacturer's Name To Be On Inside Face Of Cone.
5. Manhole To Meet Current Requirements Of ASTM Spec. C–478.
6. Min. 12" Compacted Gravel Under Base Sections.
7. Joint Configuration May Be Cast Bell–Up Or Spigot–Up.
8. Butyl mastic or approved equal shall be used in addition to the . gasket specified.
9. The exterior of all manholes shall be coated with bituminous material
10. Steps shall not be installed in manholes requiring hdpe lining.
11. Inverts For Manholes With Change Of Direction >45 Shall Be Full Depth.
12. Pre–Cast Inverts Are Not Required For Manhole Diameters >5'.
13. Interior Lining Shall Be Installed Where Required.



Dimensions	Manhole Diameter In Feet	
	5'	6'
A	60"	72"
B	84"	98"
C	6"	7"
D	8"	
E	Varies	
F	13"min.	
G	Varies	
H	6"	6"

OCTOBER 2016

3.2.1–2A

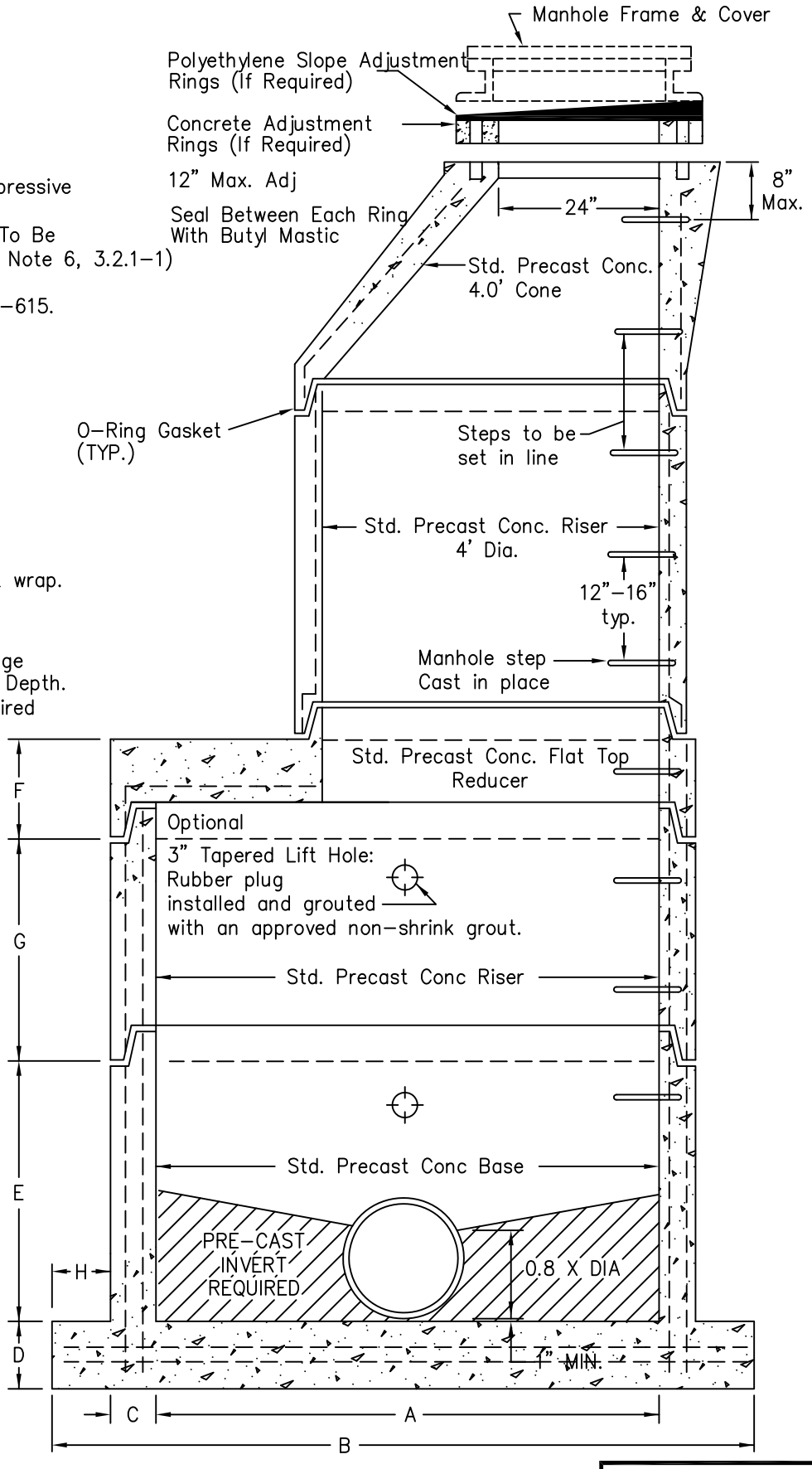
STAFFORD COUNTY DEPARTMENT OF UTILITIES

TYPICAL 5' & 6' ID PRECAST CONCRETE MANHOLE W/FLAT TOP

NOTES:

1. Concrete To Be 4000 PSI Compressive Strength, Minimum.
2. Pipe Connections To Manholes To Be Approved Flexible Sleeves. (See Note 6, 3.2.1–1)
3. All Reinforcing To Meet Current Requirements Of ASTM Spec. A–615.
4. Manufacturer's Name To Be On Inside Face Of Cone.
5. Manhole To Meet Current Requirements Of ASTM Spec. C–478.
6. Min. 12" Compacted Gravel Under Base Sections.
7. Joint Configuration May Be Cast Bell–Up Or Spigot–Up.
8. Exterior joints shall be sealed with an approved manhole joint wrap.
9. See Note 5, 3.2.1–1
10. See Note 7, 3.2.1–1
11. Inverts For Manholes With Change Of Direction >45 Shall Be Full Depth.
12. Pre–Cast Inverts Are Not Required For Manhole Diameters >5'.
13. Interior Coating Required.

Dimensions	
A	96"
B	113"
C	9"
D	
E	
F	
G	
H	8"



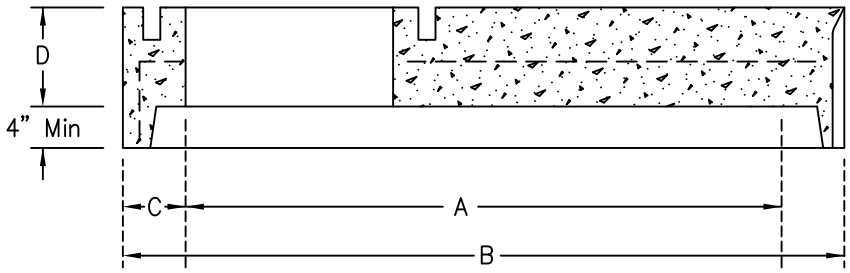
OCTOBER 2016

3.2.1–2B

STAFFORD COUNTY DEPARTMENT OF UTILITIES

TYPICAL 8' ID PRECAST CONCRETE MANHOLE W/4' STACK

SECTION A–A

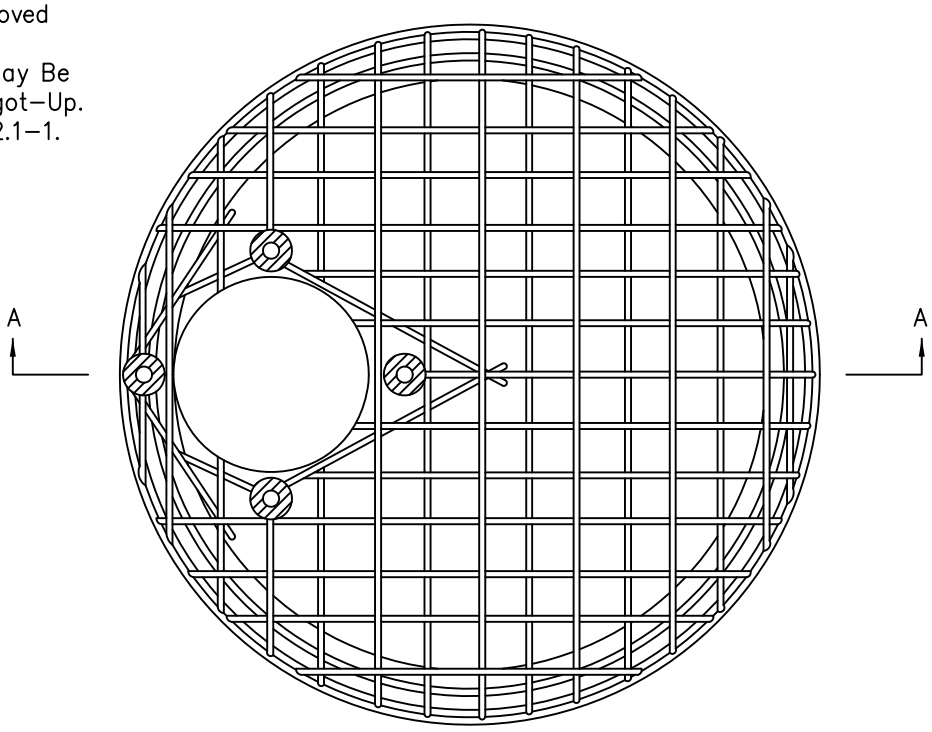


NOTES:

1. Concrete To Be 4000 PSI Compressive Strength, Min.
2. All Reinforcing Steel To Meet Current Requirements Of ASTM Spec. A–615.
3. Manhole Sections To Meet Current Requirements Of ASTM Spec. C–478.
4. Flat Top Shall Be Used Only When Specifically Required By The Plans Or Where There Is Height Or Invert Conflict As Determined By The Contractor And Approved By The County.
5. Joint Configuration May Be Cast Bell–Up Or Spigot–Up.
6. See Note 5, Sec. 3.2.1–1.

MANHOLE SIZE

	4'	5'	6'
A	48"	60"	72"
B	58"	72"	86"
C	5"	6"	7"
D	6"	8"	8"



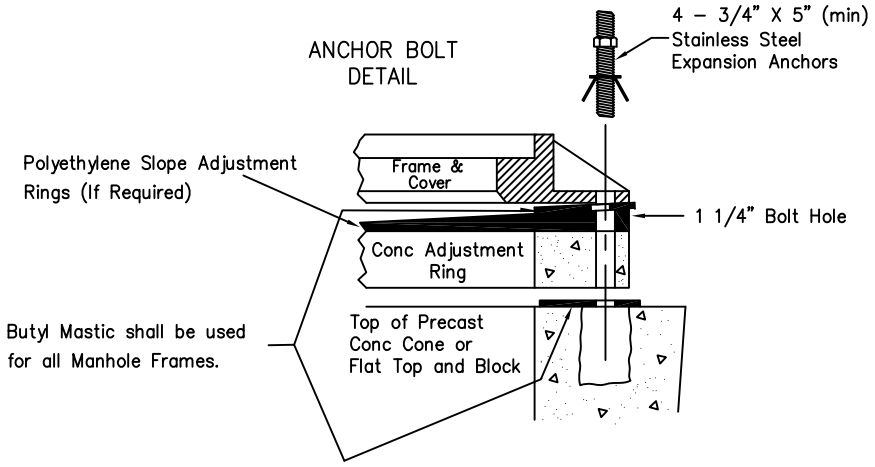
TOP VIEW

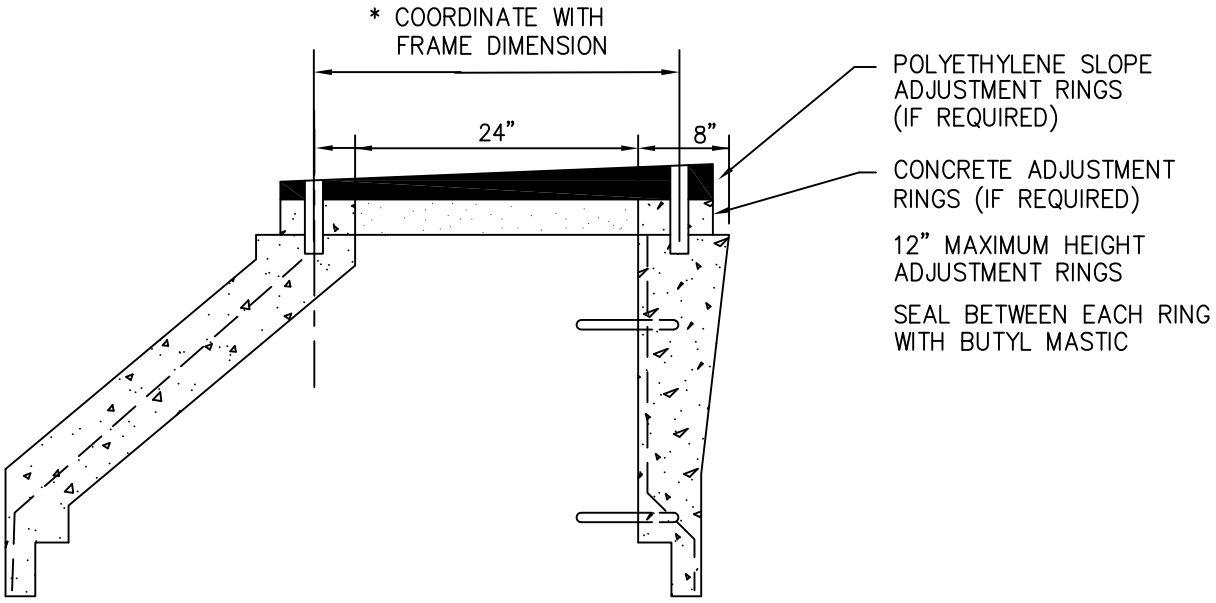
DECEMBER 2004

3.2.1–3

STAFFORD COUNTY DEPARTMENT OF UTILITIES

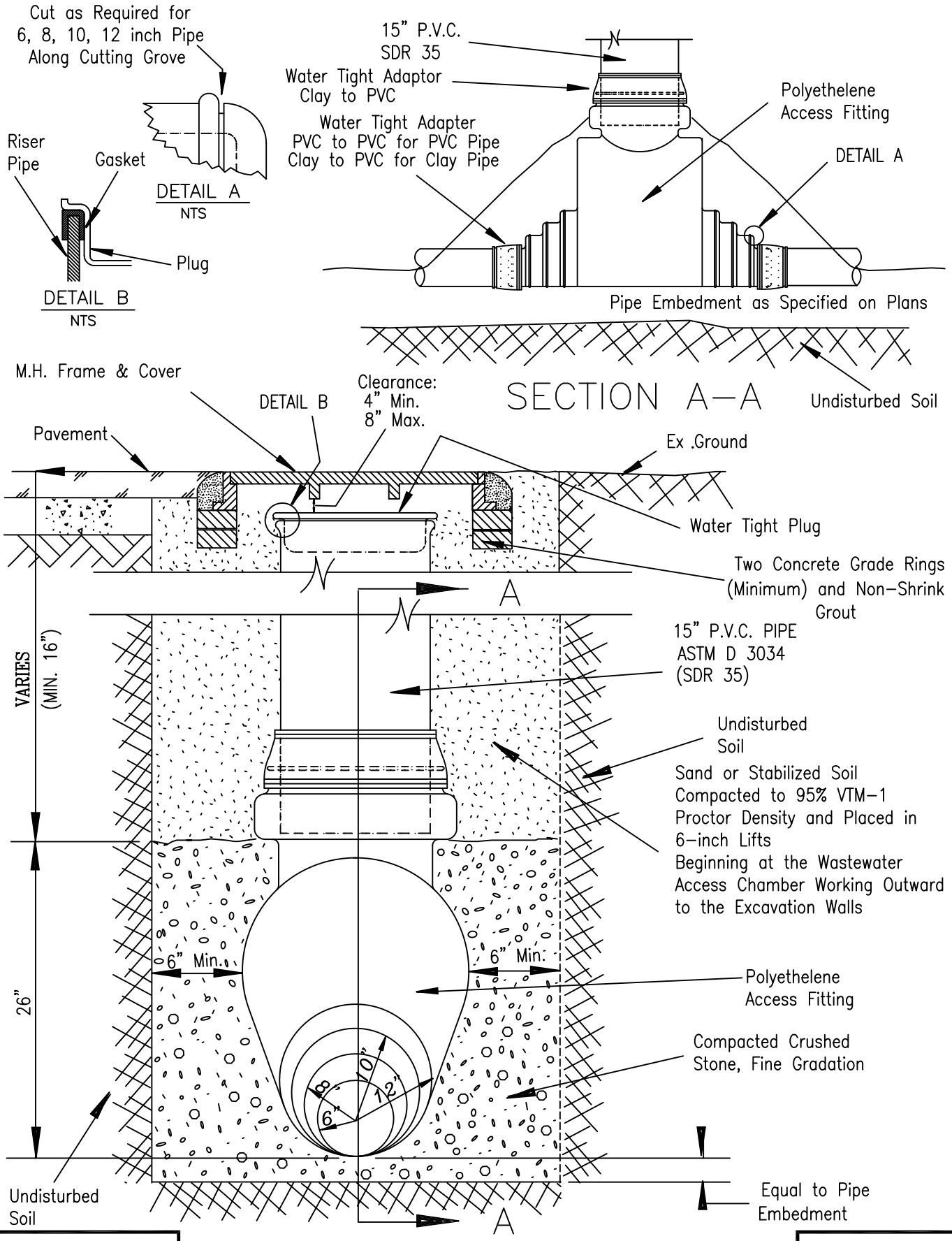
PRECAST CONCRETE MANHOLE FLAT TOP



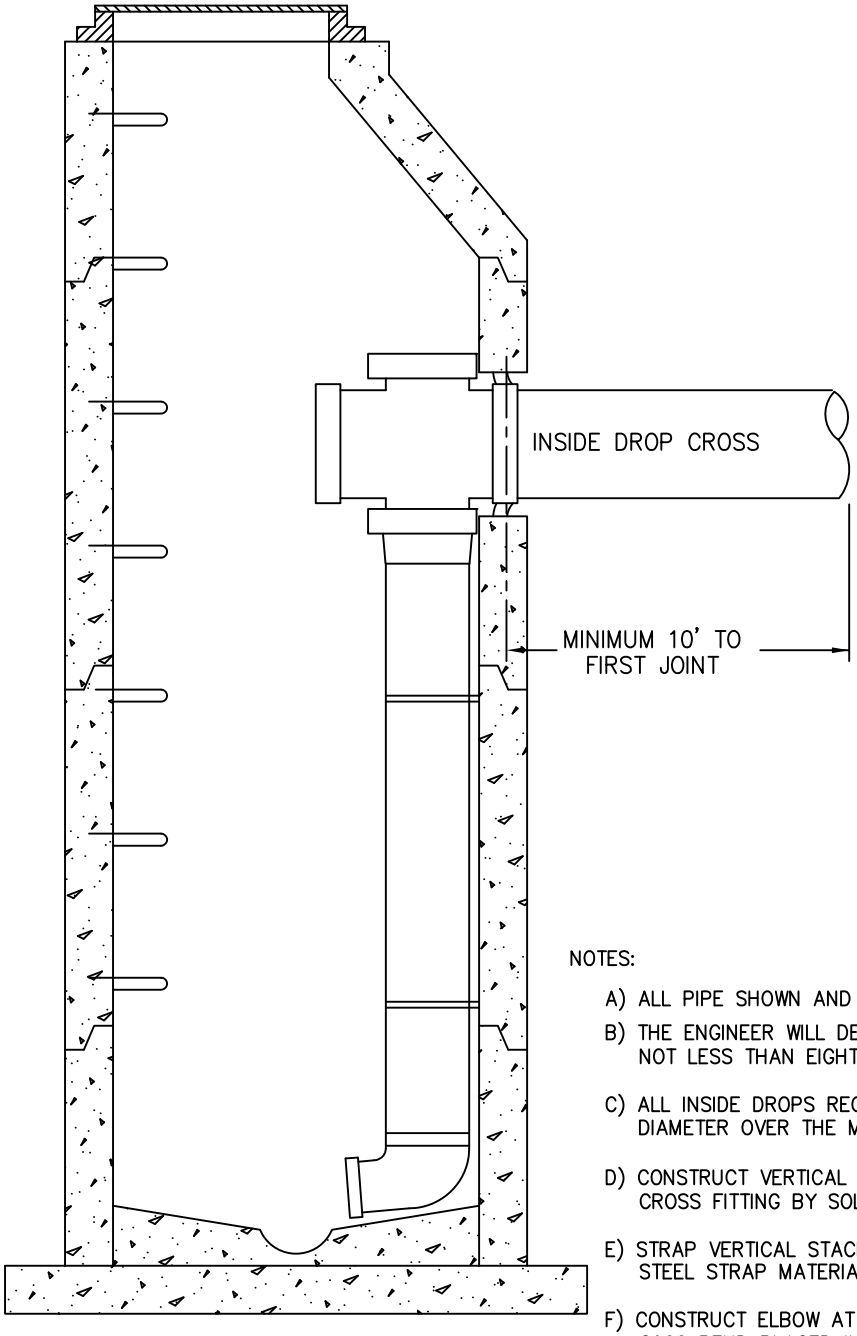


NOTE:
1. STAINLESS STEEL ALL–THREAD ROD WITH EPOXY GROUT CAPSULES MAY BE USED IN LIEU OF EXPANSION ANCHORS WITH APPROVAL OF COUNTY.

DECEMBER 2004	3.2.1–4
STAFFORD COUNTY DEPARTMENT OF UTILITIES	MANHOLE ANCHOR BOLT



DECEMBER 2004	3.2.1—5
STAFFORD COUNTY DEPARTMENT OF UTILITIES	ACCESS CHAMBER



NOT TO SCALE

NOTES:

A) ALL PIPE SHOWN AND CROSS TO BE AWWA C900 SOLVENT WELDED.

B) THE ENGINEER WILL DETERMINE THE SIZE OF THE VERTICAL STACK, BUT NOT LESS THAN EIGHT (8) INCHES IN DIAMETER.

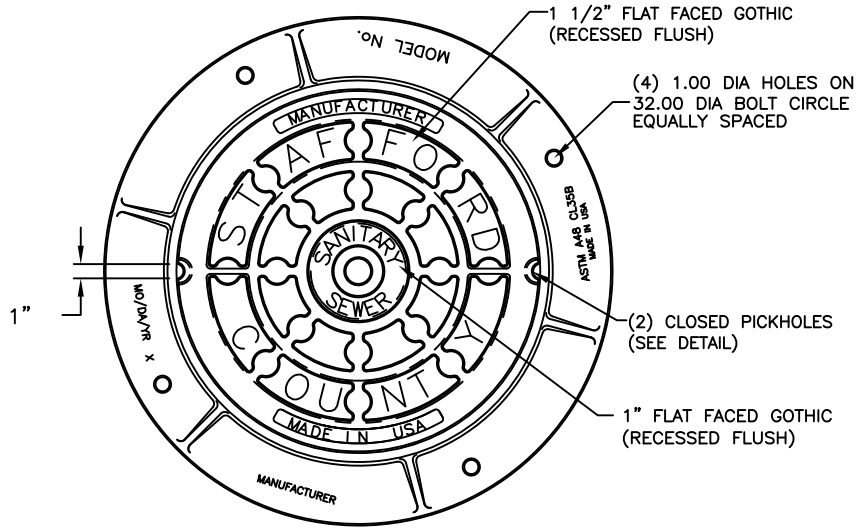
C) ALL INSIDE DROPS REQUIRE ONE (1) FOOT INCREASE IN MANHOLE DIAMETER OVER THE MIN. DIAMETER FOR REQUIRED PIPE DIAMETER.

D) CONSTRUCT VERTICAL STACK OF SDR C900 PIPE CONNECTED TO CROSS FITTING BY SOLVENT WELD.

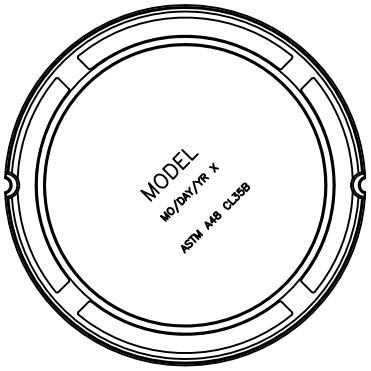
E) STRAP VERTICAL STACK TO MANHOLE WALL. USE STAINLESS STEEL STRAP MATERIAL.

F) CONSTRUCT ELBOW AT BOTTOM OF THE STACK FROM EITHER 45° OR 90° C900 BEND PLACED IN THE DIRECTION OF FLOW IN THE MANHOLE WITH BENCH CONSTRUCTED TO CONFORM TO MANHOLE BENCH.

SEPT 2016	3.2.2–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TYPICAL MANHOLE WITH INSIDE DROP CONNECTION

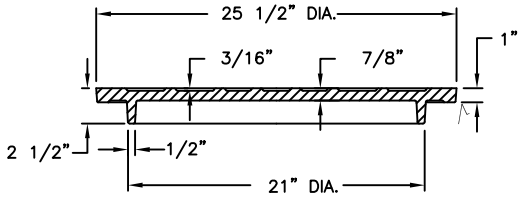


PLAN VIEW TOP

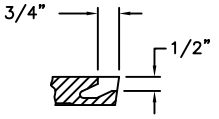


PLAN VIEW
BOTTOM OF COVER

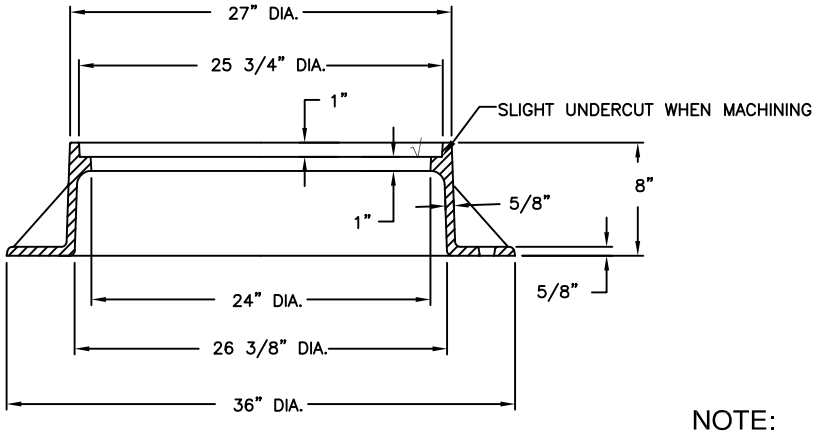
WEIGHT: FRAME, 215 LBS
COVER, 125 LBS
TOTAL, 340 LBS



SECTION OF COVER



PICKHOLE DETAIL

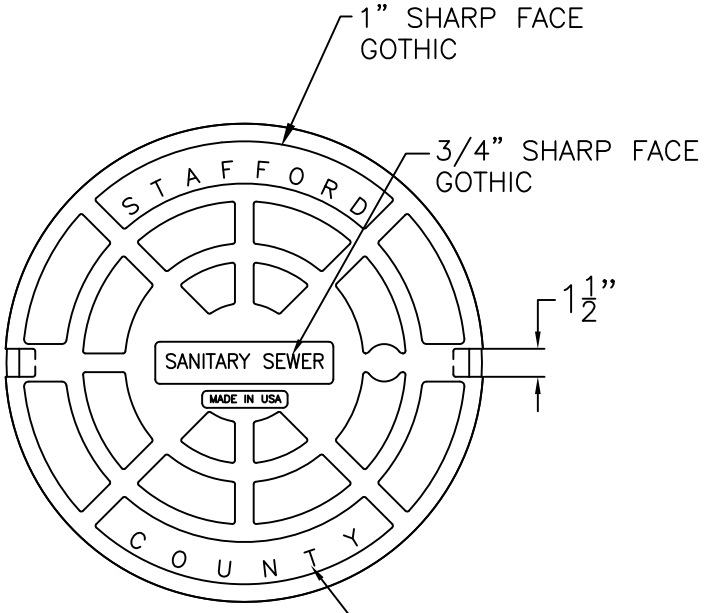


SECTION OF FRAME

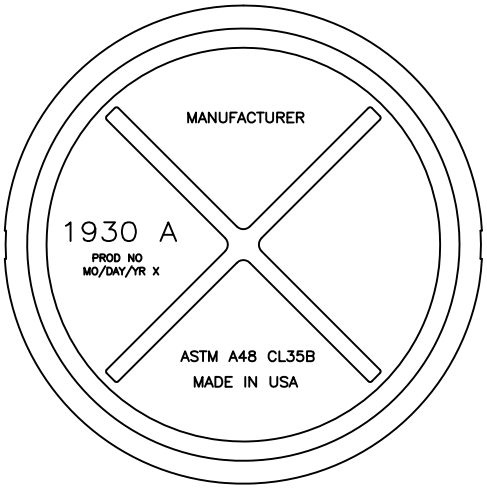
√ MACHINED SURFACE

NOTE:
FOR REQUIREMENTS ON SECURING FRAME TO CONE, SEE DETAIL 3.2.1-4

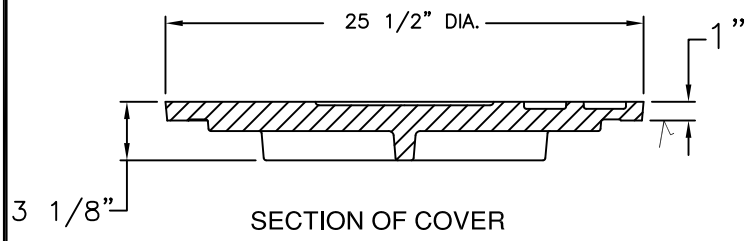
OCTOBER 2016	3.2.3–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	STANDARD MANHOLE FRAME & COVER



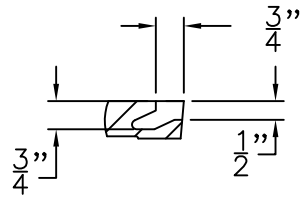
PLAN VIEW TOP



PLAN VIEW
BOTTOM OF COVER

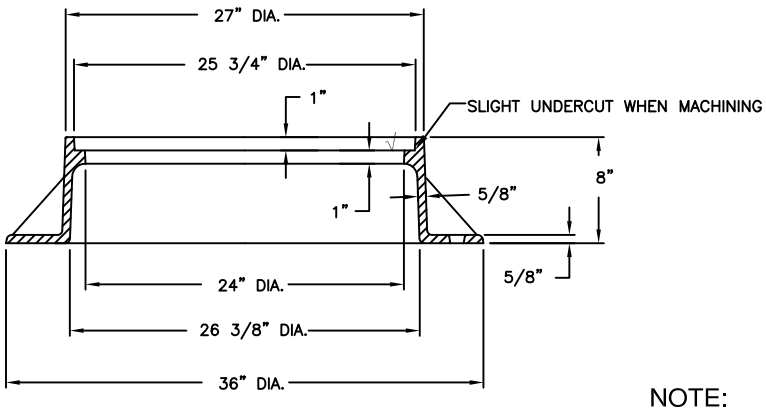


SECTION OF COVER



PICKHOLE SECTION

√ MACHINED SURFACE



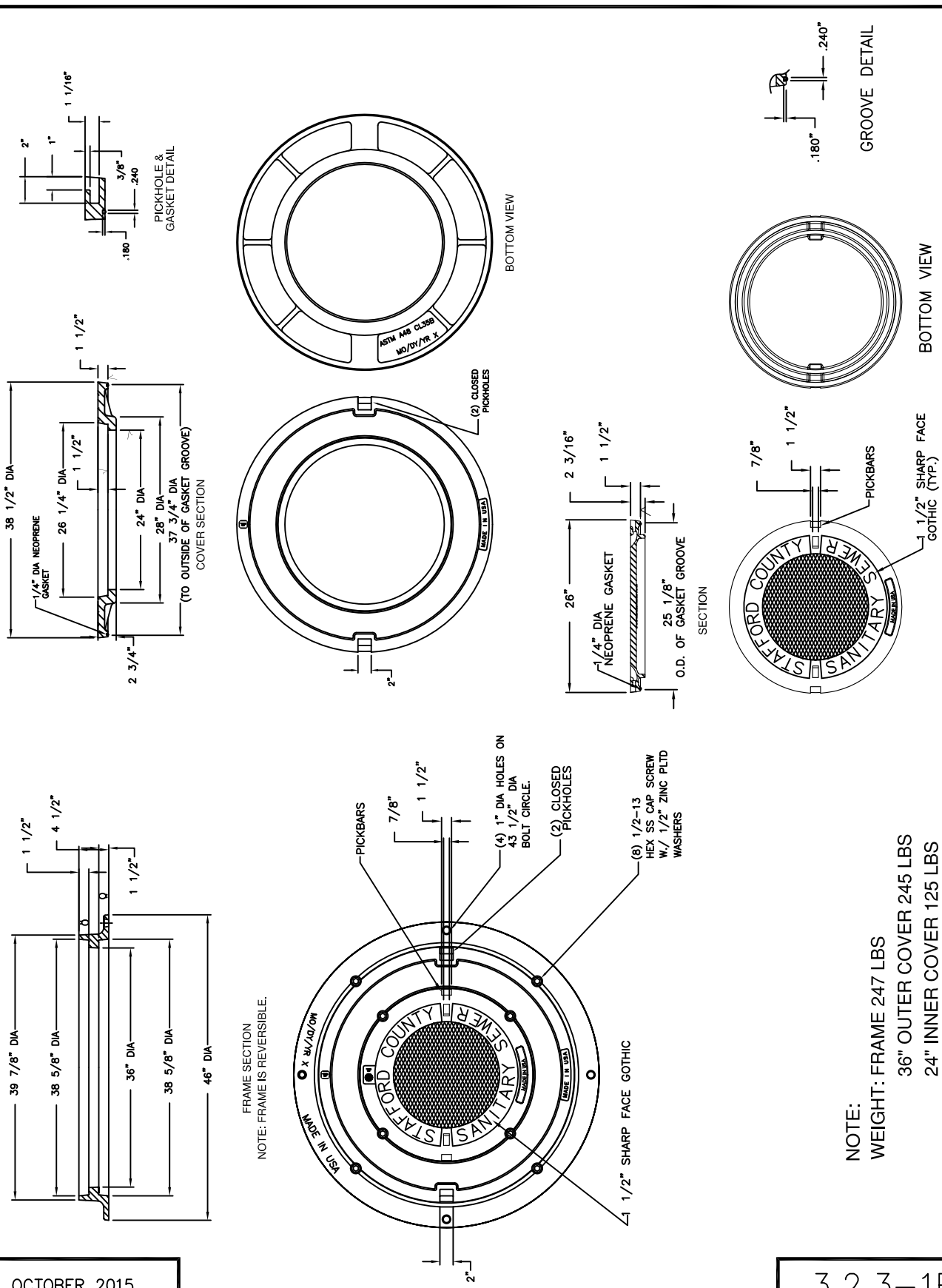
SECTION OF FRAME

WEIGHT: FRAME, 215 LBS
COVER, 180 LBS
TOTAL, 395 LBS

√ MACHINED SURFACE

NOTE:
FOR REQUIREMENTS ON SECURING FRAME TO CONE, SEE DETAIL 3.2.1-4

JULY 2016	3.2.3–1A
STAFFORD COUNTY DEPARTMENT OF UTILITIES	HEAVY WEIGHT TRAFFIC STANDARD FRAME & COVER

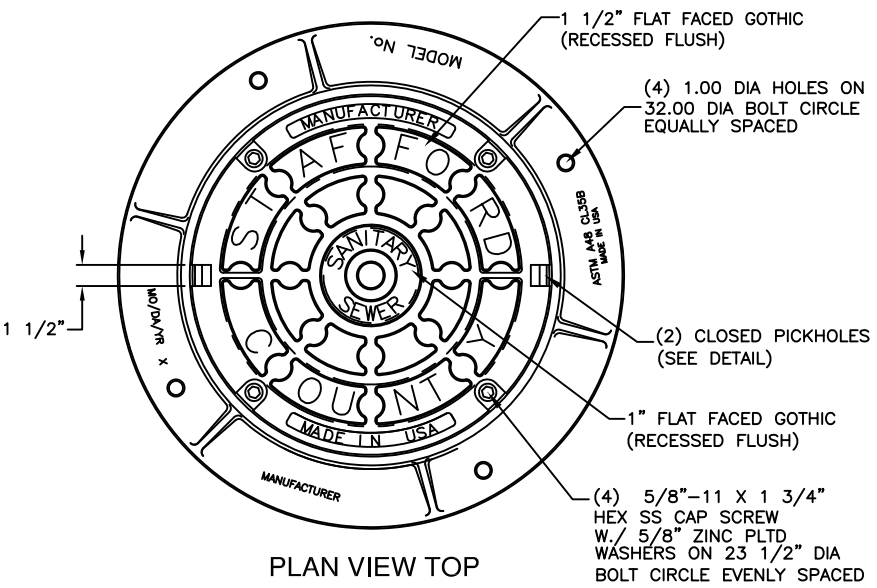


OCTOBER 2015

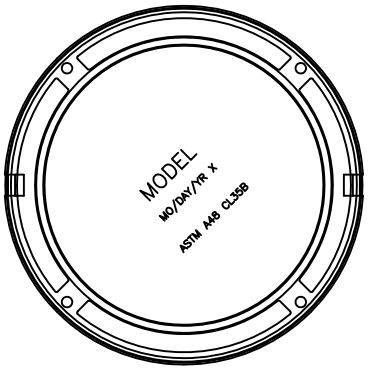
3.2.3–1B

STAFFORD COUNTY DEPARTMENT OF UTILITIES

36–INCH FRAME AND COVER

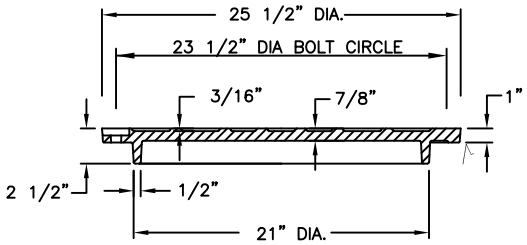


PLAN VIEW TOP

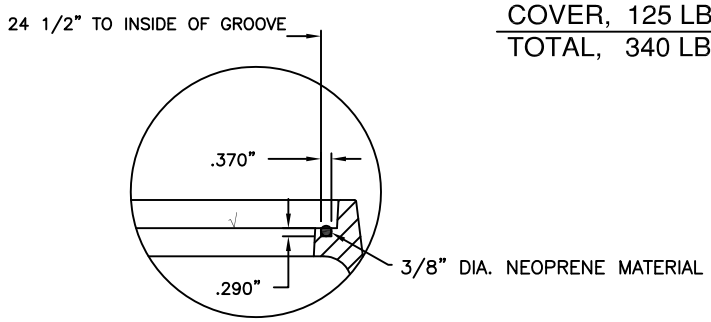


PLAN VIEW
BOTTOM OF COVER

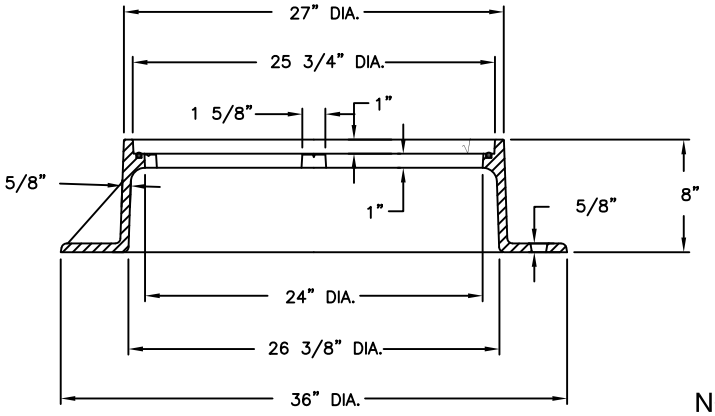
WEIGHT: FRAME, 215 LBS
COVER, 125 LBS
TOTAL, 340 LBS



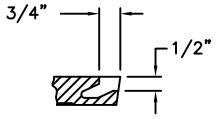
SECTION OF COVER



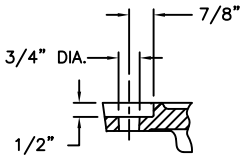
GROOVE DETAIL



SECTION OF FRAME



PICKHOLE DETAIL

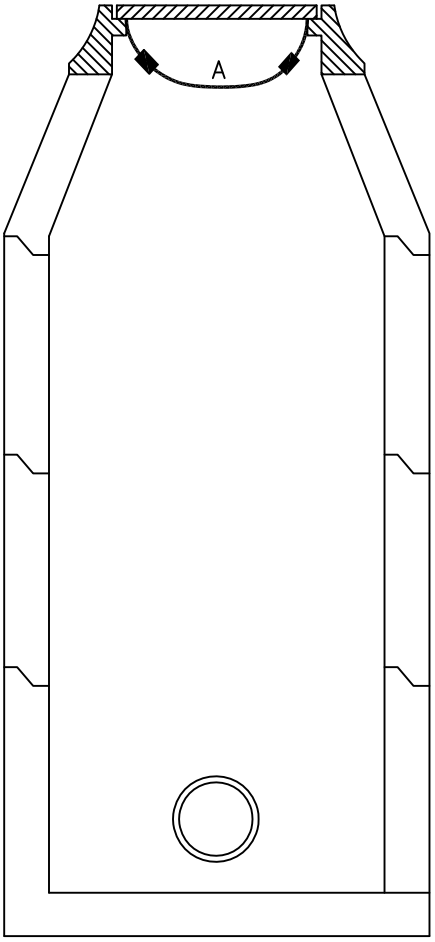


BOLT HOLE SECTION

√ MACHINED SURFACE

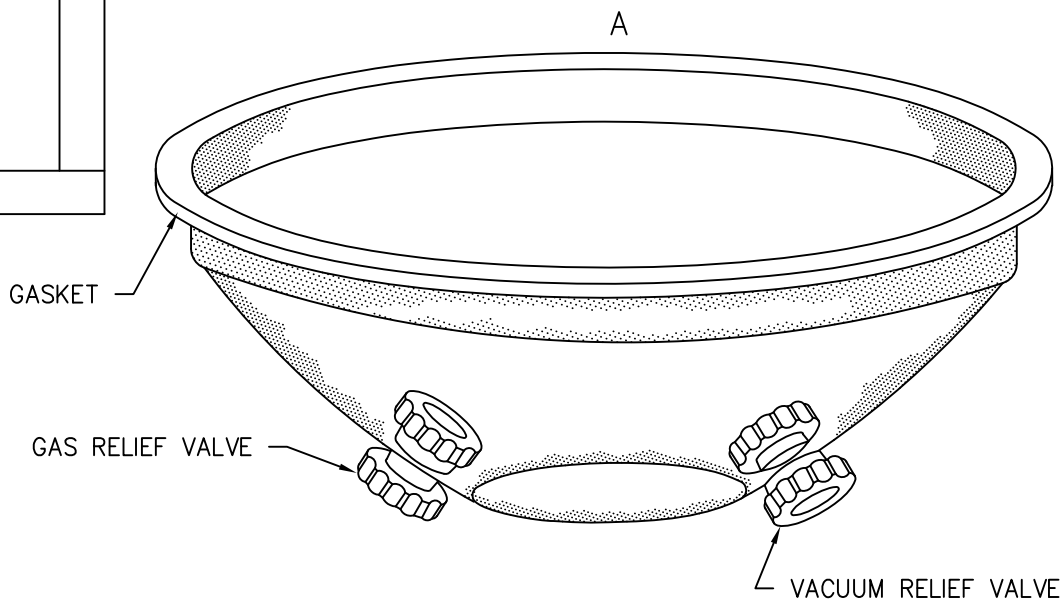
NOTE:
FOR REQUIREMENTS ON SECURING FRAME
TO CONE, SEE DETAIL 3.2.1-4

JULY 2016	3.2.3–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATERTIGHT MANHOLE STANDARD WEIGHT FRAME & COVER



NOTE:

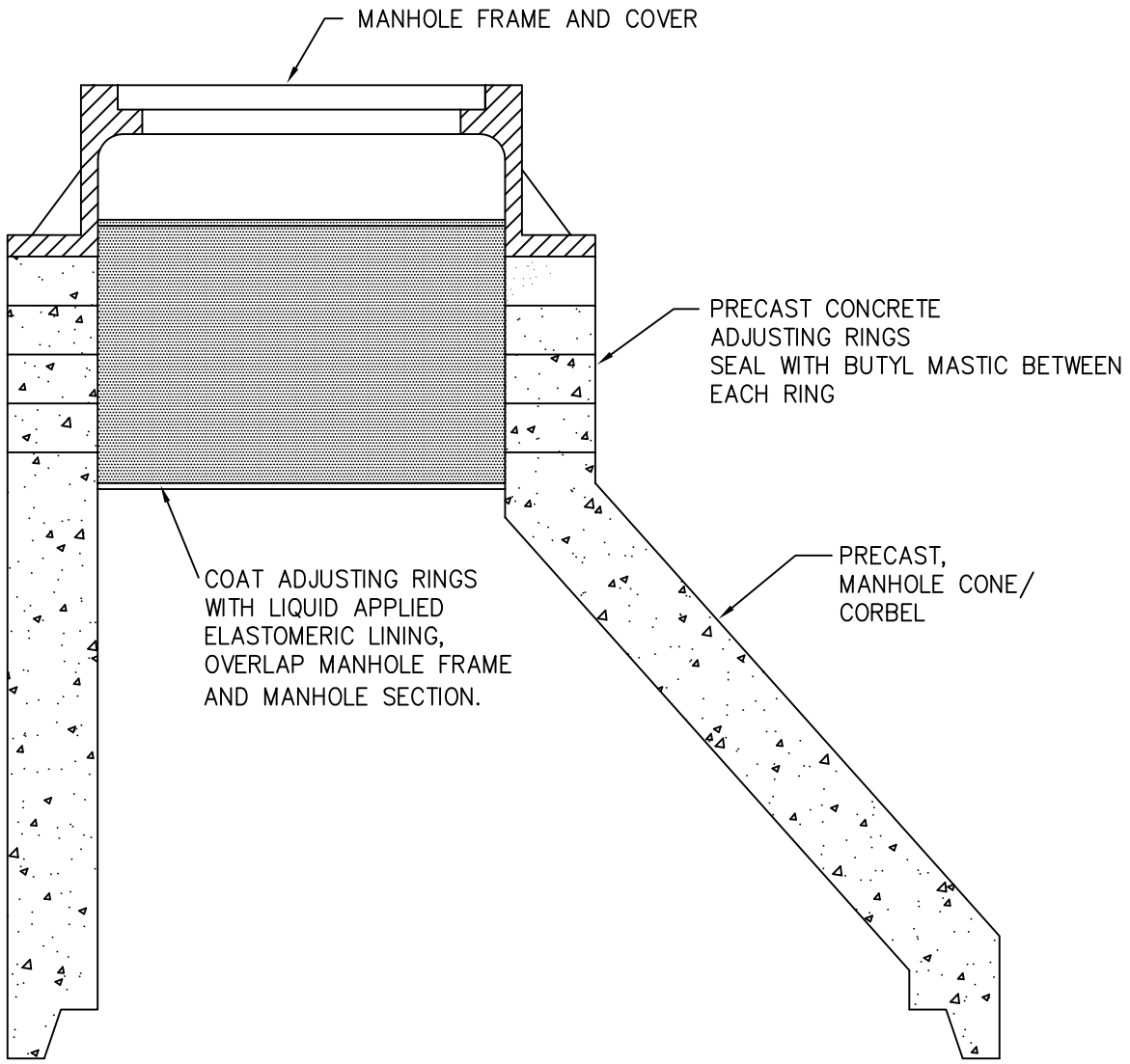
1. The insert will be deep enough to prevent the manhole cover from coming in contact with the valves when the manhole cover is removed or installed.
2. The insert will restrict inflow to no more than 5 gal. in 24 hrs.
3. Manhole inserts shall be installed in all non–watertight manhole frames installed at grade or at the direction of the utility inspector.

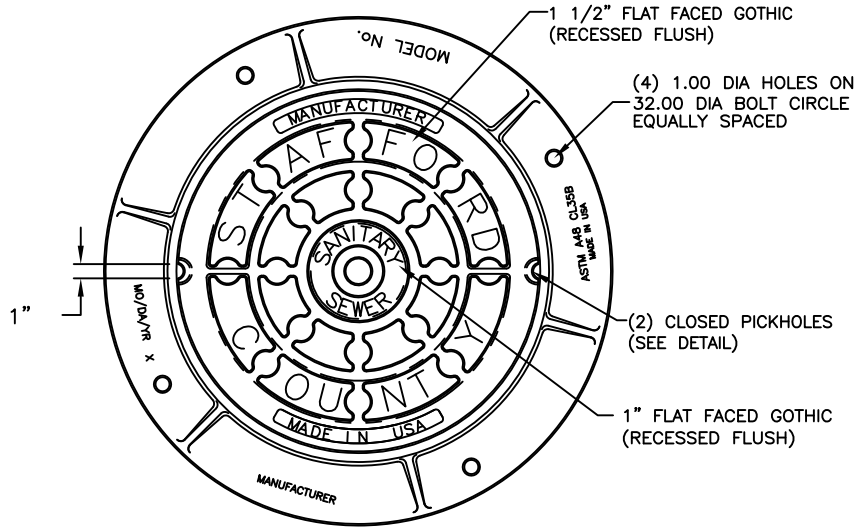


NOTES:

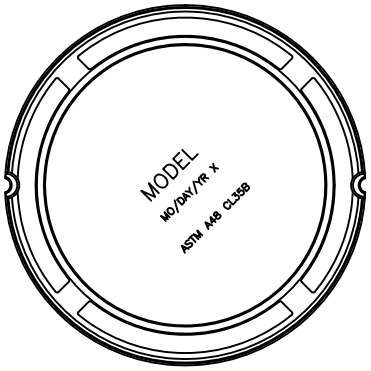
1. The manhole insert will be made of non–corrodible materials and will not be damaged by sewer gases or road oil.
2. Both the gas relief and the vacuum relief valves will be self–cleaning and made of non–corrodible materials.
3. The gas relief valve will be automatically activated at a pressure differential of approx. 0.5 TO 1.5 psi.
4. The vacuum relief valve will be automatically activated at a pressure differential of approx. 2.25 psi.
5. A gasket will be installed under the lip of the insert to ensure a tight seal between the insert and the manhole frame.

SEPT 2016	3.2.3–3
STAFFORD COUNTY DEPARTMENT OF UTILITIES	WATERPROOF MANHOLE INSERT



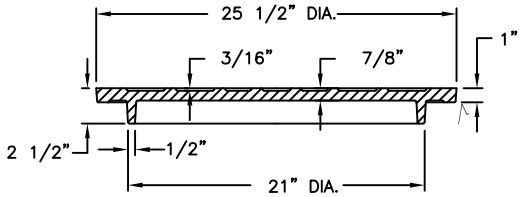


PLAN VIEW TOP

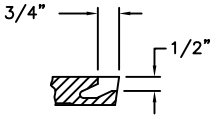


PLAN VIEW
BOTTOM OF COVER

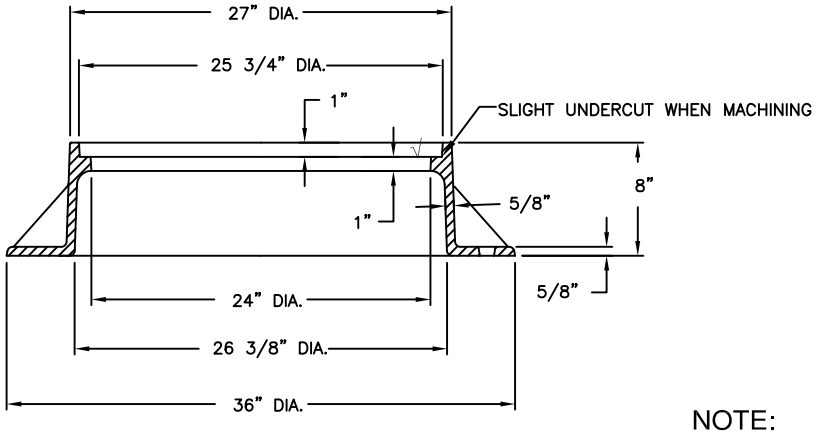
WEIGHT: FRAME, 215 LBS
COVER, 125 LBS
TOTAL, 340 LBS



SECTION OF COVER



PICKHOLE DETAIL



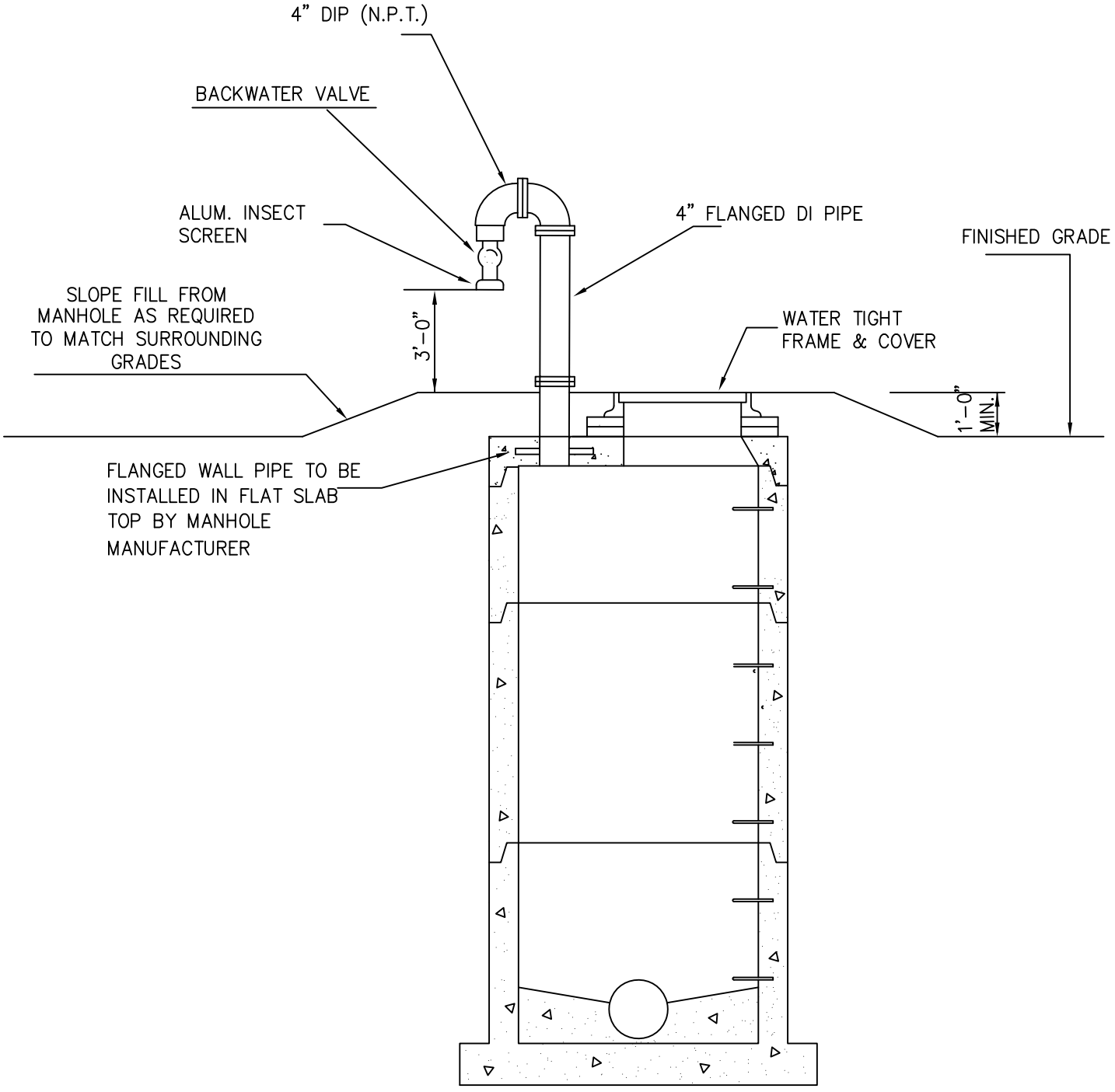
SECTION OF FRAME

√ MACHINED SURFACE

NOTE:
FOR REQUIREMENTS ON SECURING FRAME TO CONE, SEE DETAIL 3.2.1-4

OCTOBER 2016	3.2.3–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	STANDARD MANHOLE FRAME & COVER

NOTE: PAINT EXPOSED PORTION OF PIPE GREEN RUST INHIBITIVE PAINT.



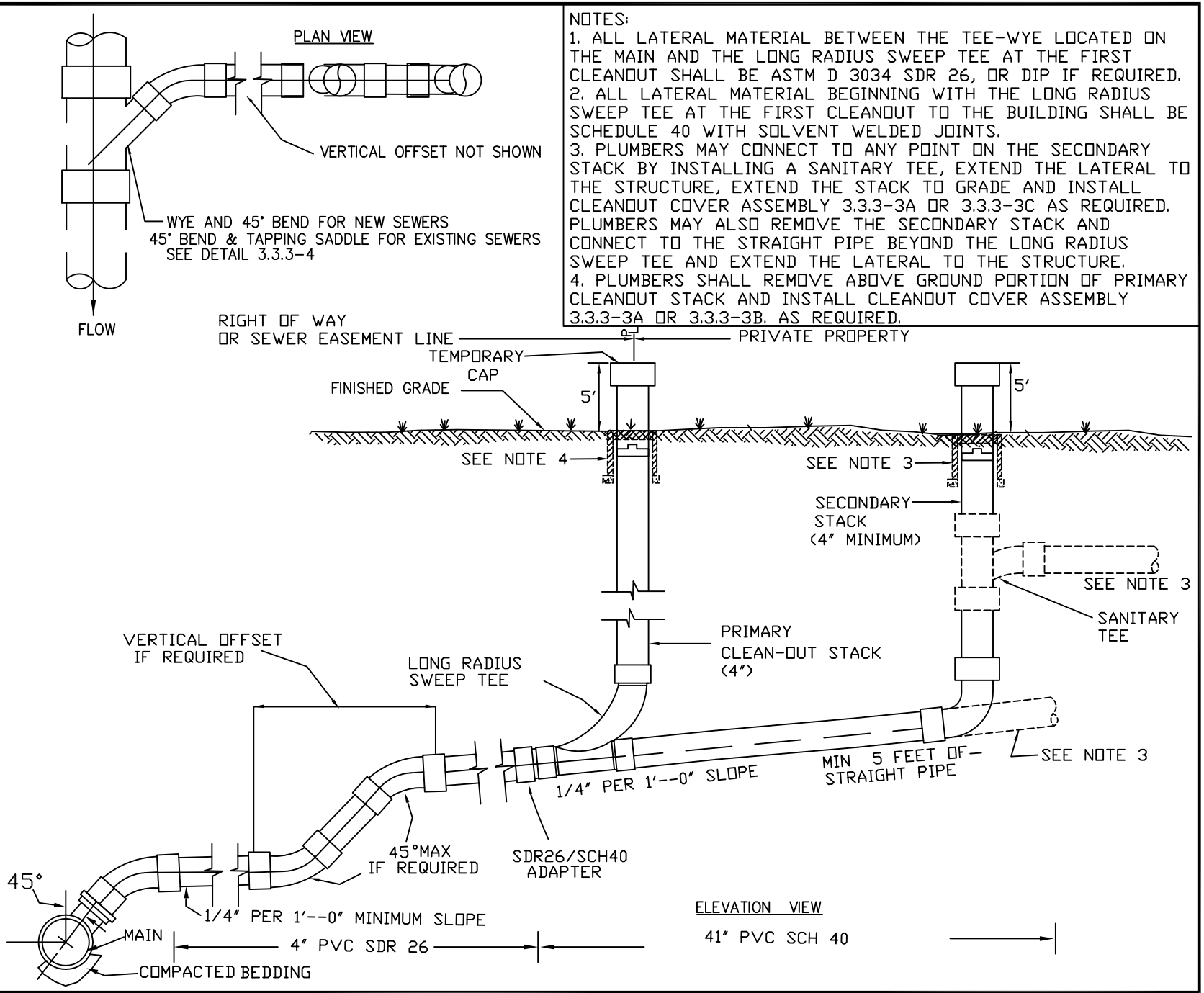
MARCH 2006	3.2.5–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	MANHOLE VENT

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

SEPT 2016

4-INCH SEWER HOUSE CONNECTION

3.3.3-1A



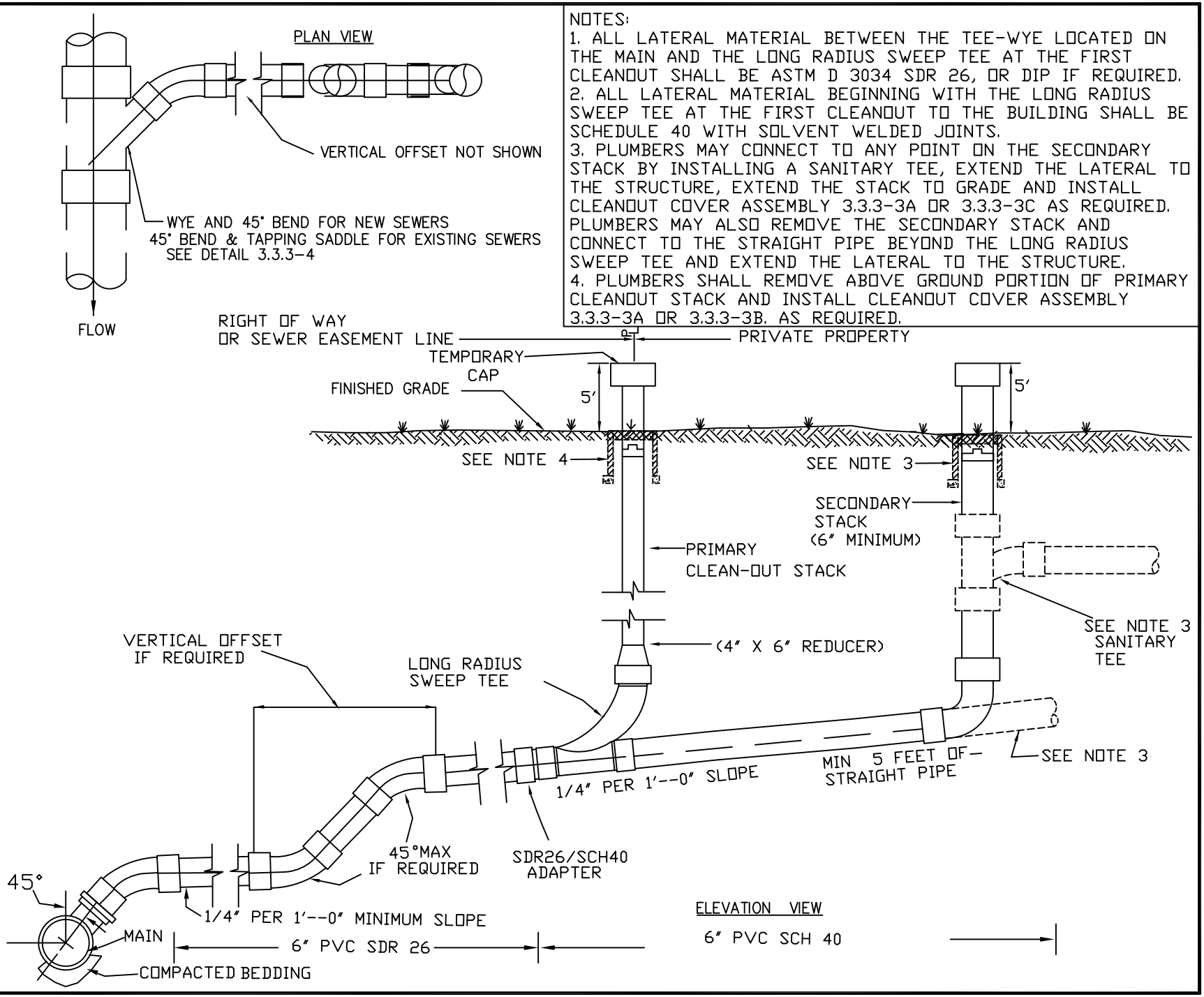
NOTES:
1. ALL LATERAL MATERIAL BETWEEN THE TEE-WYE LOCATED ON THE MAIN AND THE LONG RADIUS SWEEP TEE AT THE FIRST CLEANOUT SHALL BE ASTM D 3034 SDR 26, OR DIP IF REQUIRED.
2. ALL LATERAL MATERIAL BEGINNING WITH THE LONG RADIUS SWEEP TEE AT THE FIRST CLEANOUT TO THE BUILDING SHALL BE SCHEDULE 40 WITH SOLVENT WELDED JOINTS.
3. PLUMBERS MAY CONNECT TO ANY POINT ON THE SECONDARY STACK BY INSTALLING A SANITARY TEE, EXTEND THE LATERAL TO THE STRUCTURE, EXTEND THE STACK TO GRADE AND INSTALL CLEANOUT COVER ASSEMBLY 3.3.3-3A OR 3.3.3-3C AS REQUIRED. PLUMBERS MAY ALSO REMOVE THE SECONDARY STACK AND CONNECT TO THE STRAIGHT PIPE BEYOND THE LONG RADIUS SWEEP TEE AND EXTEND THE LATERAL TO THE STRUCTURE.
4. PLUMBERS SHALL REMOVE ABOVE GROUND PORTION OF PRIMARY CLEANOUT STACK AND INSTALL CLEANOUT COVER ASSEMBLY 3.3.3-3A OR 3.3.3-3B, AS REQUIRED.

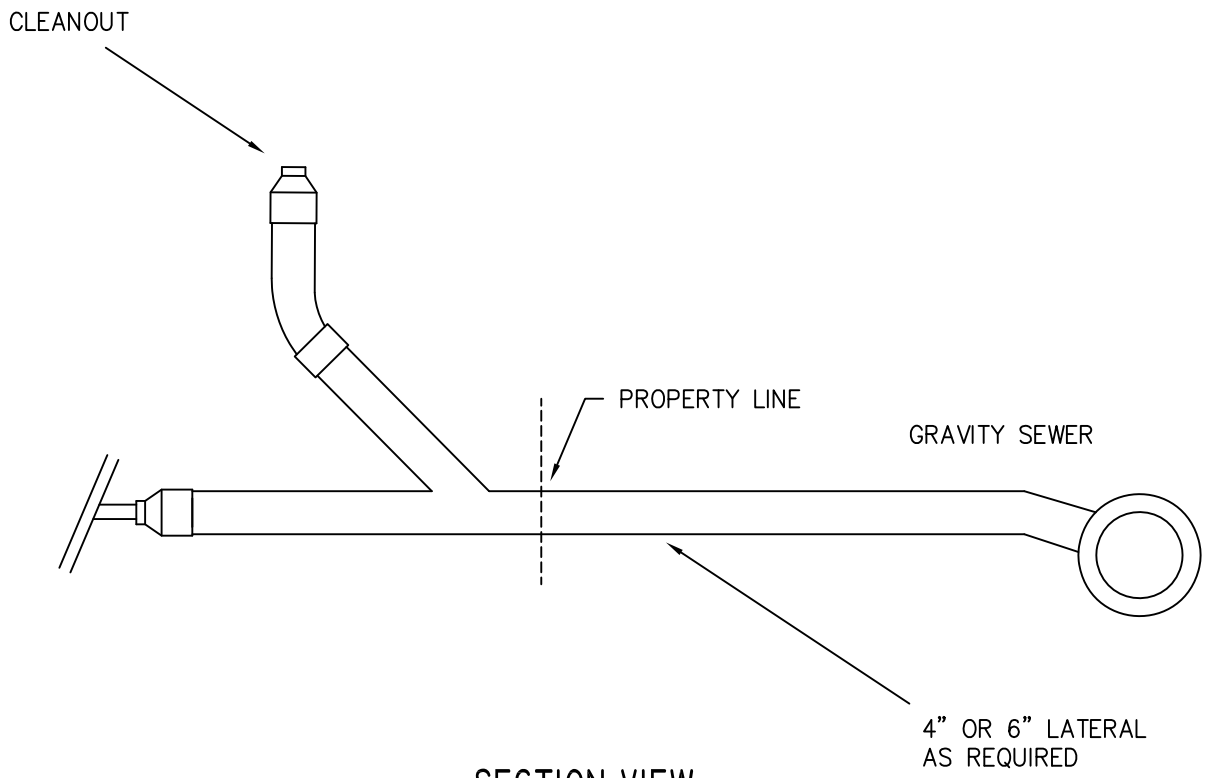
STAFFORD COUNTY
DEPARTMENT OF UTILITIES

SEPT 2016

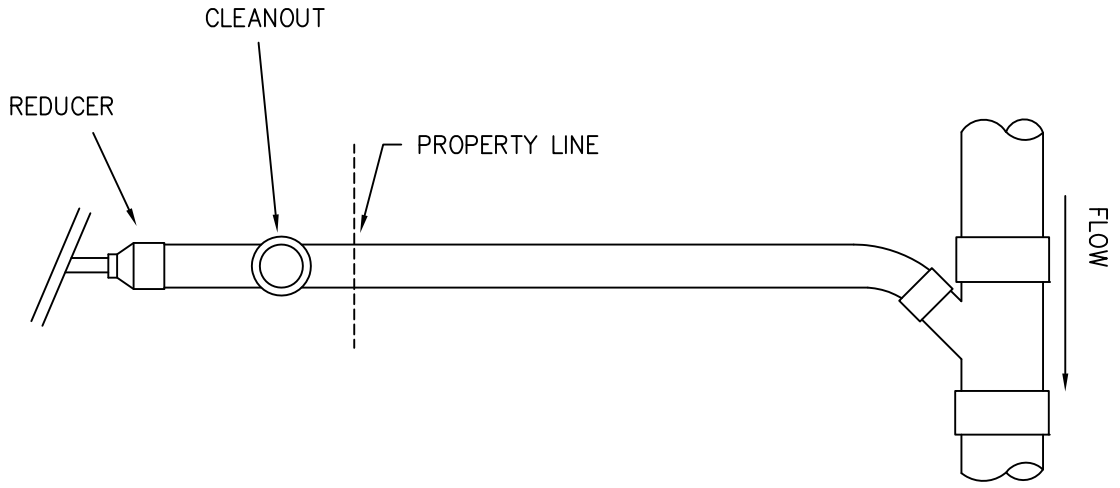
6-INCH SEWER HOUSE CONNECTION

3.3.3-1B





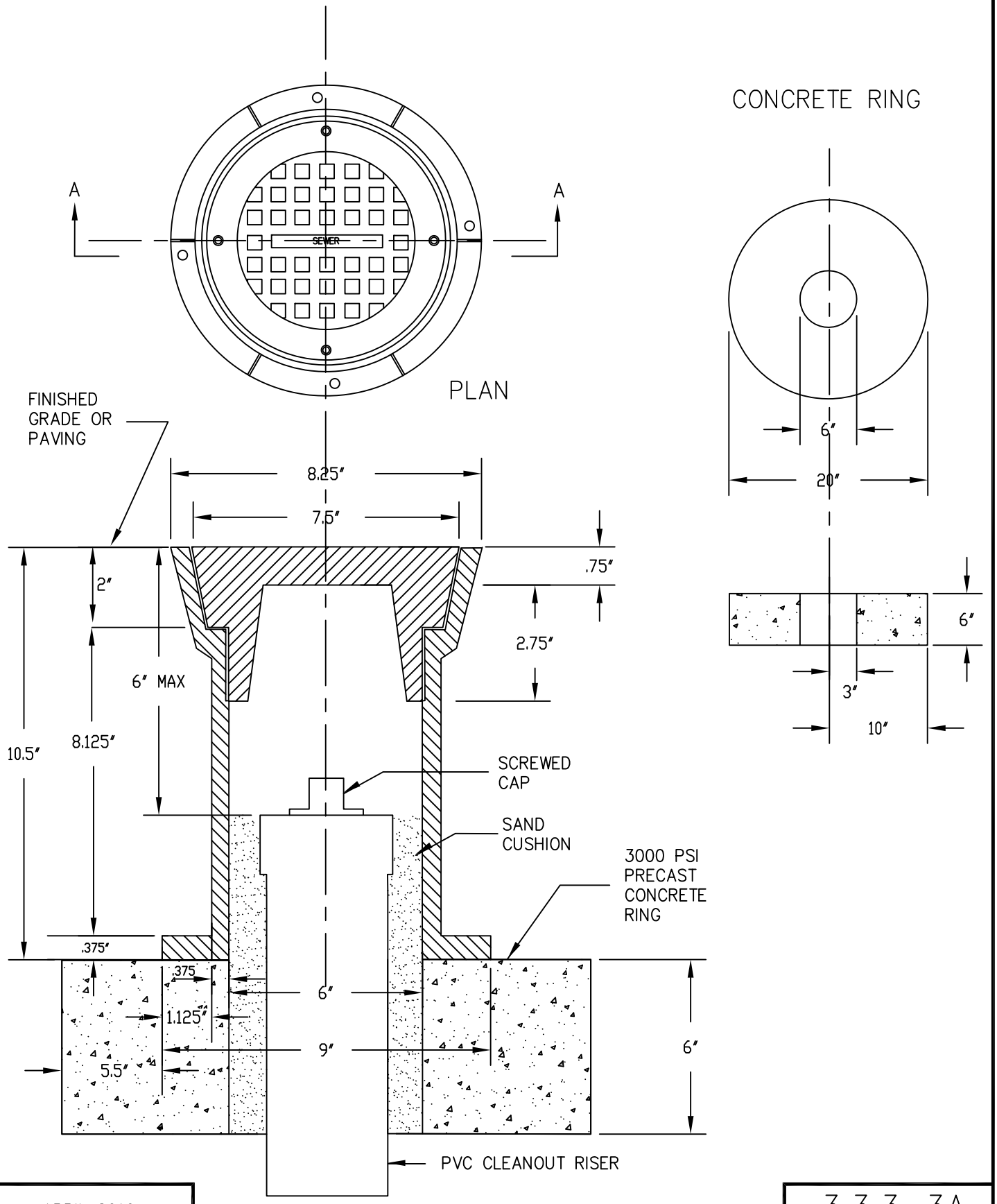
SECTION VIEW



PLAN VIEW

NOTE: PLACE CLEAN OUT AT PROPERTY LINE OR EDGE OF EASEMENT

DECEMBER 2004	3.3.3–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	LOW PRESSURE HOUSE SERVICE CONNECTION TO GRAVITY SEWER

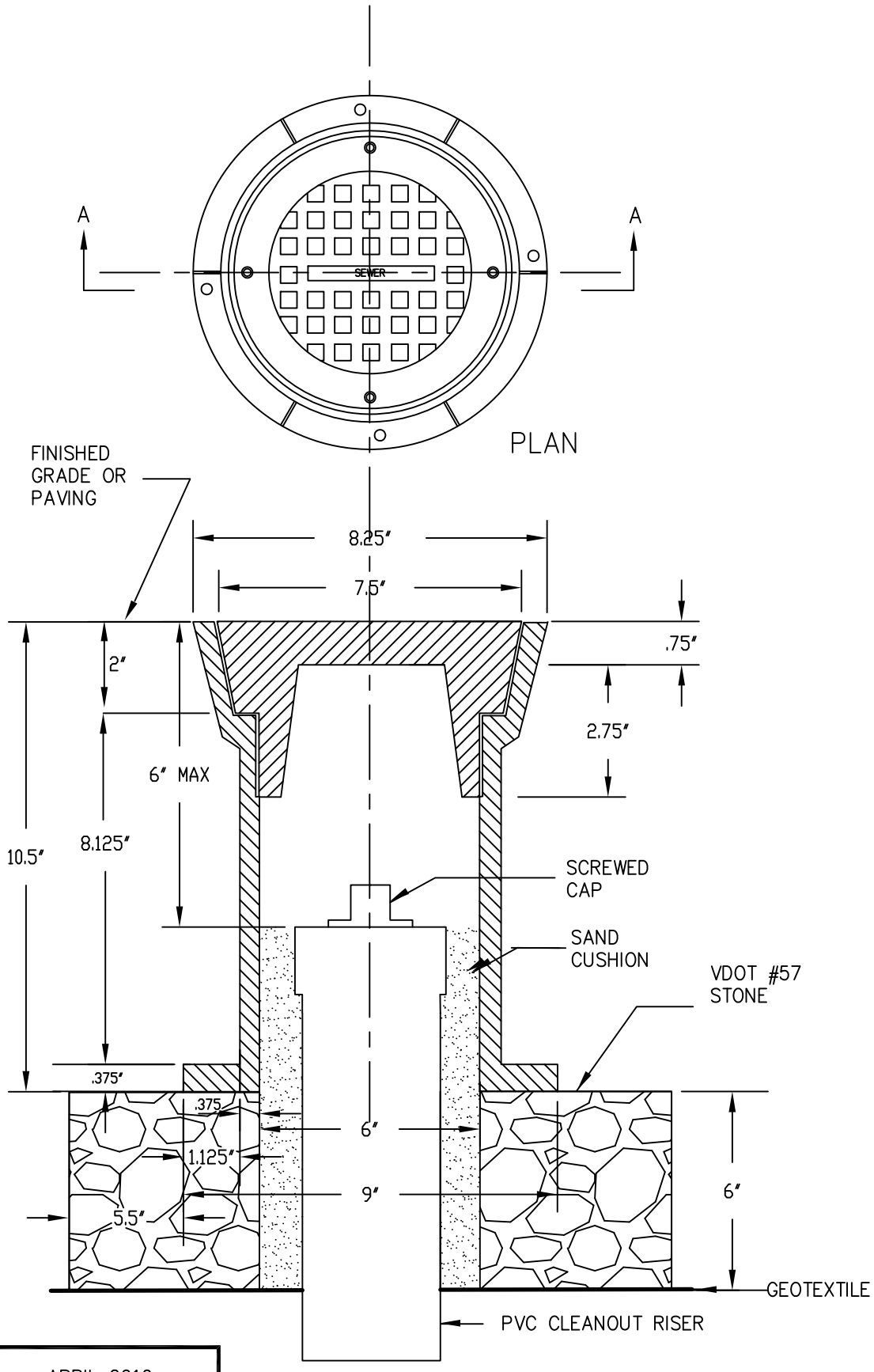


APRIL 2010

3.3.3–3A

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

CLEANOUT COVER ASSEMBLY
FOR 4" CLEANOUTS IN AREAS SUBJECT
TO VEHICLE TRAFFIC

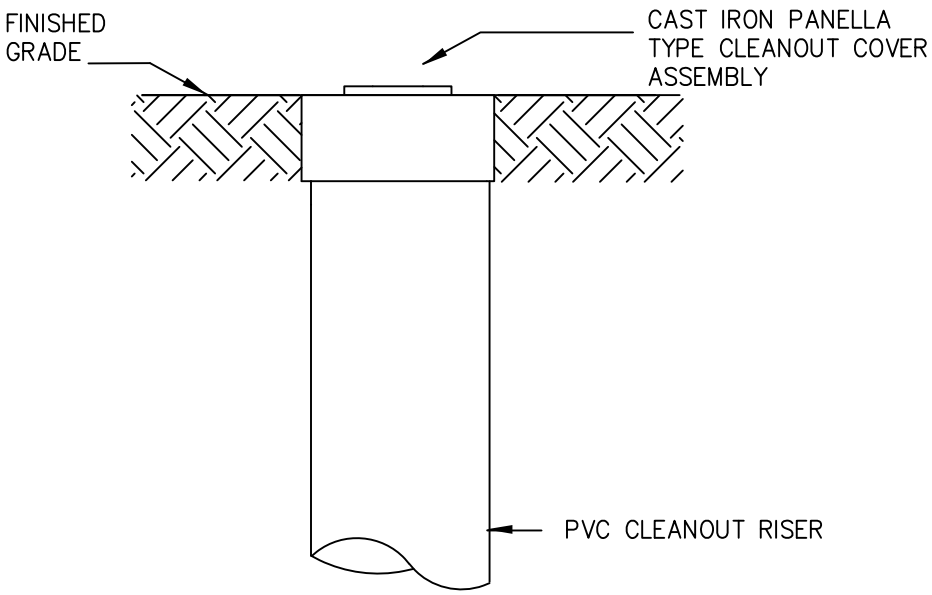


APRIL 2010

3.3.3–3B

STAFFORD COUNTY DEPARTMENT OF UTILITIES

CLEANOUT COVER ASSEMBLY FOR 4" CLEANOUTS AT EASEMENTS AND PROPERTY LINES



ASSEMBLY NOTE:

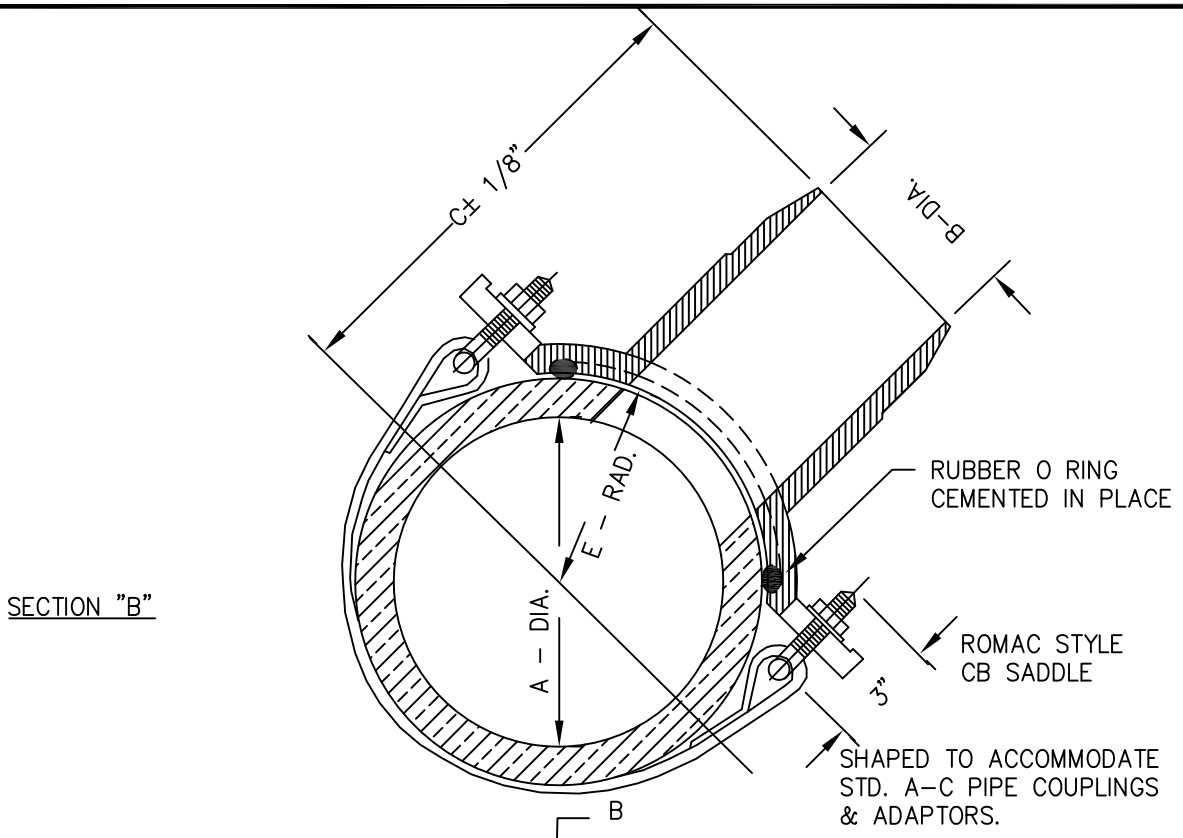
LUBRICATE CAP THREADS WITH
ANTI–SIEZE LUBRICANT

APRIL 2010

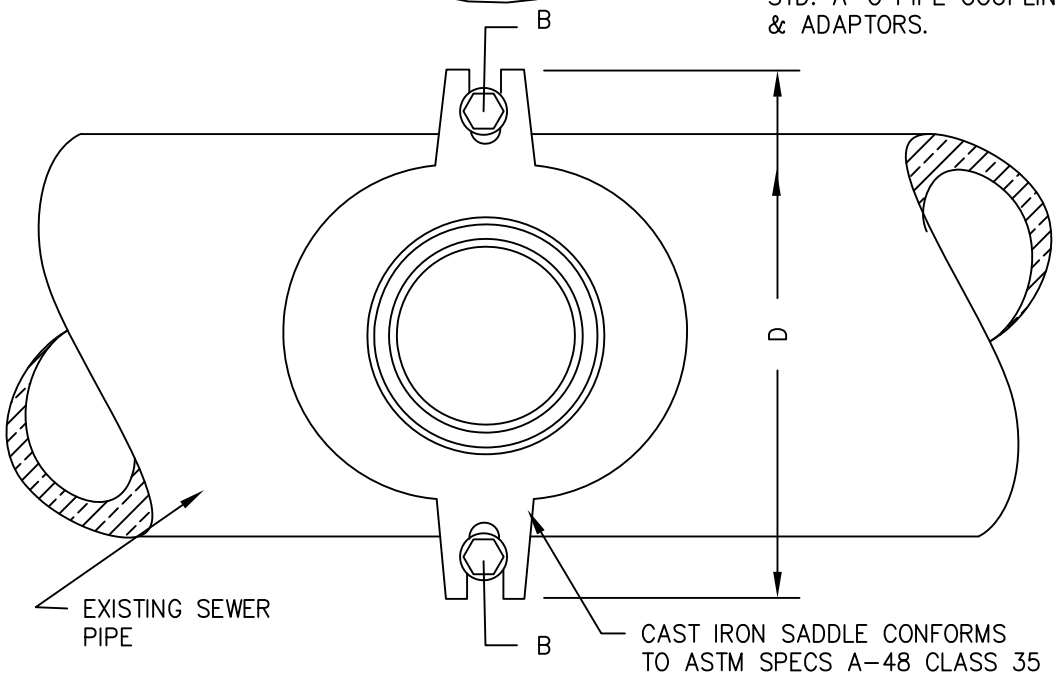
3.3.3–3C

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

PANELLA–TYPE CLEANOUT CAP ASSEMBLY
FOR 4" CLEANOUTS IN INTERIOR
YARD AREAS



SECTION "B"



PLAN VIEW

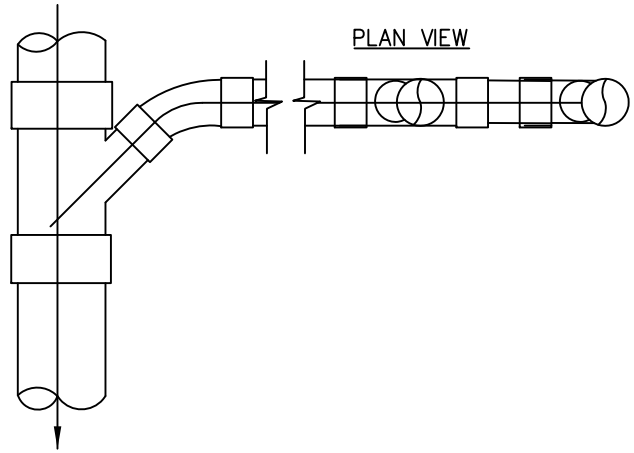
OCTOBER 2016	3.3.3-4
STAFFORD COUNTY DEPARTMENT OF UTILITIES	SEWER HOUSE TAP FOR EXISTING MAIN

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

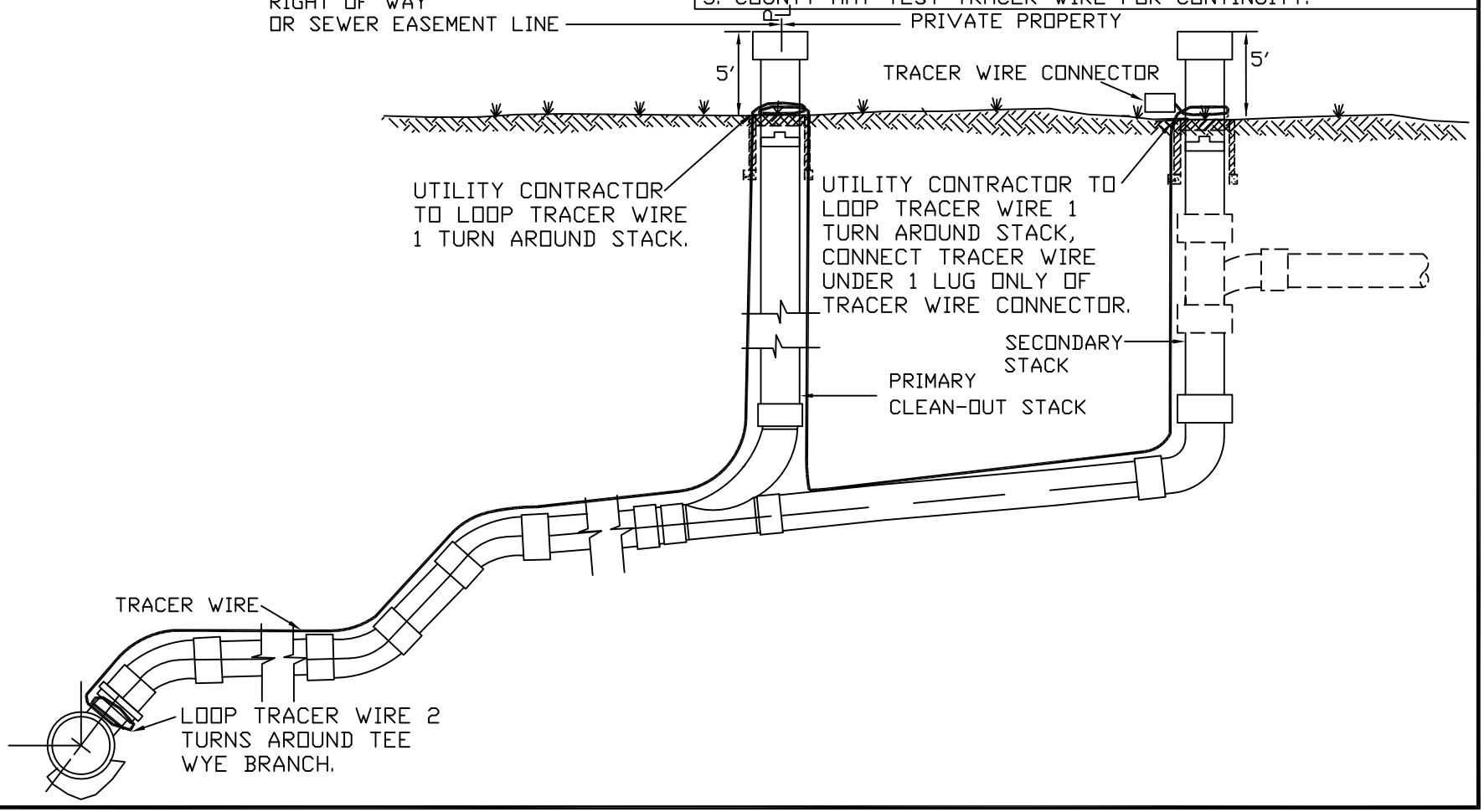
SEPT 2016

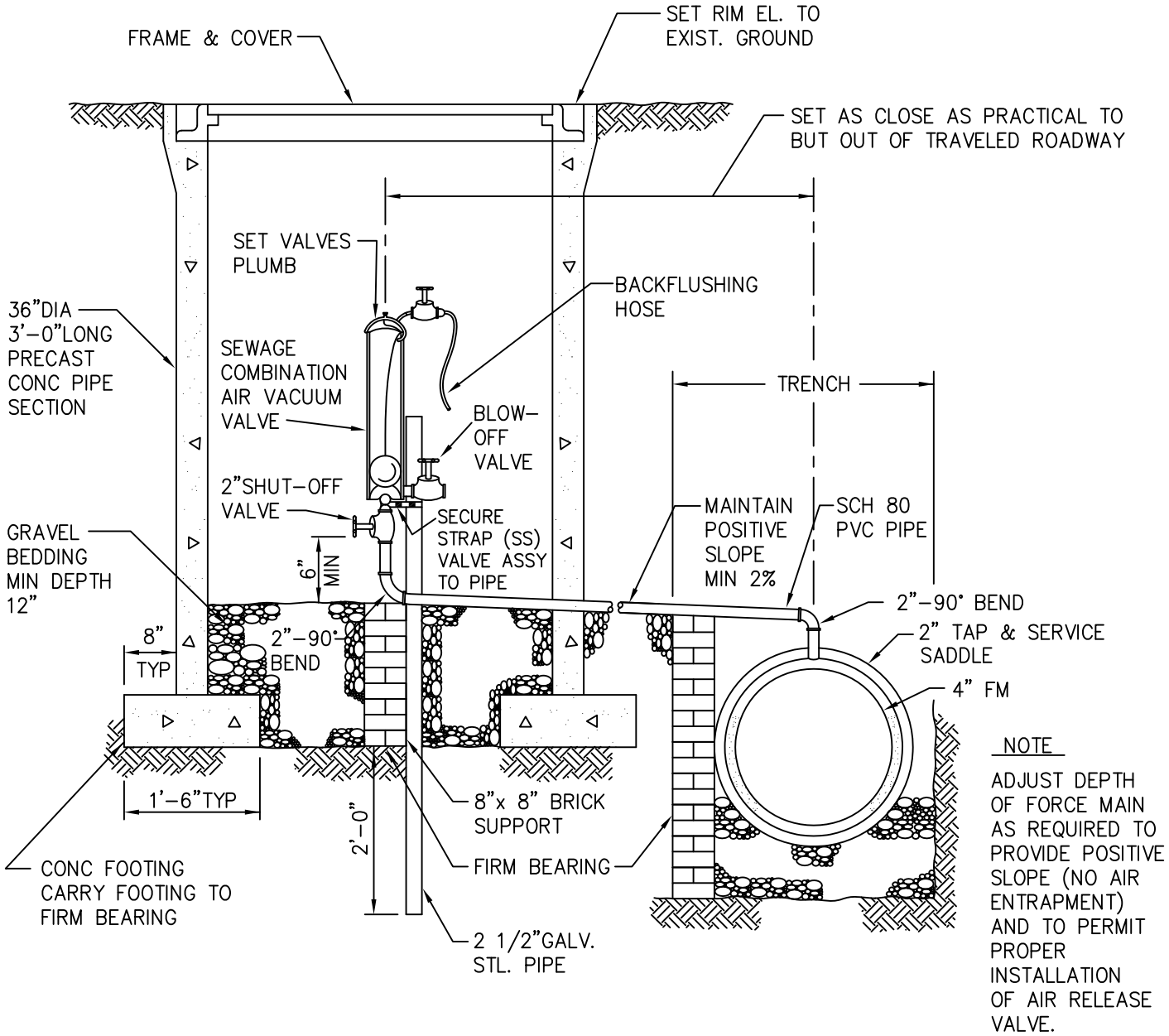
TRACER WIRE FOR SEWER LATERALS

3.3.3-5



NOTES:
1. ALL SEWER LATERALS SHALL HAVE TRACER WIRE TAPED TO PIPE AND STACKS.
2. UTILITY CONTRACTORS SHALL WRAP TRACER WIRE AROUND BRANCH OF THE WYE, TAPE TO LATERAL AND PRIMARY STACK, CONTINUE TO SECONDARY STACK AND TERMINATE WITH TRACER WIRE CONNECTOR UNDER 1 LUG, LEAVE CONNECTOR UNSEALED, PROTECT WITH PLASTIC BAG AND TAPE TO STACK.
3. PLUMBER SHALL MOVE MOST OF TRACER WIRE TO SAND BETWEEN STACK AND CLEANOUT COVER; LEAVE 6" OF WIRE EXPOSED IN CLEANOUT COVER.
4. PLUMBER SHALL DETACH TRACER WIRE AS NECESSARY FROM SECONDARY STACK OR STRAIGHT PIPE BEYOND PRIMARY STACK, ATTACH TRACER WIRE TO UNUSED LUG OF TRACER WIRE CONNECTOR, SEAL TRACER WIRE CONNECTOR AND EXTEND TRACER WIRE ALONG SEWER LATERAL TO STRUCTURE IN ACCORDANCE WITH 703.6 OF THE VIRGINIA PLUMBING CODE.
5. COUNTY MAY TEST TRACER WIRE FOR CONTINUITY.



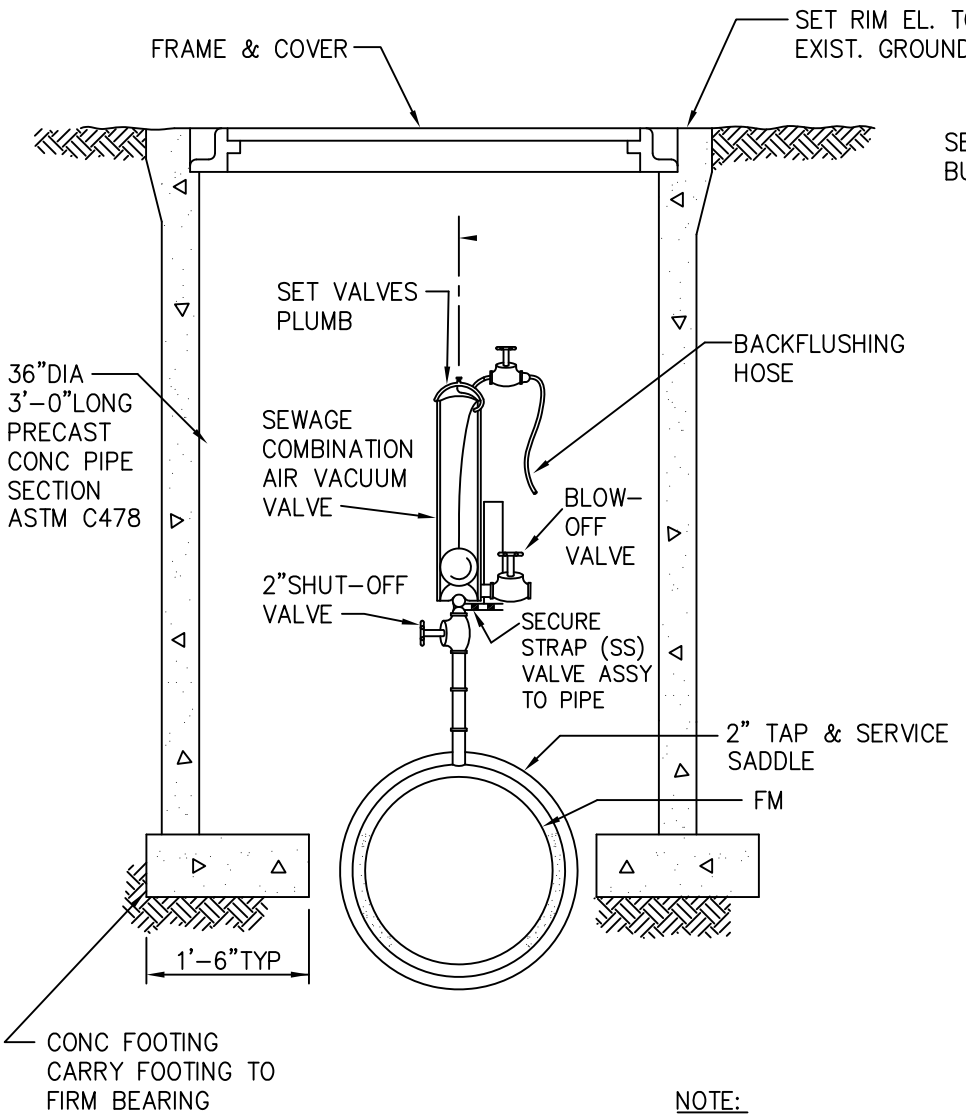


DECEMBER 2004

4.2.5-1

STAFFORD COUNTY DEPARTMENT OF UTILITIES

SEWAGE COMBINATION AIR/VACUUM VALVE



NOTE:

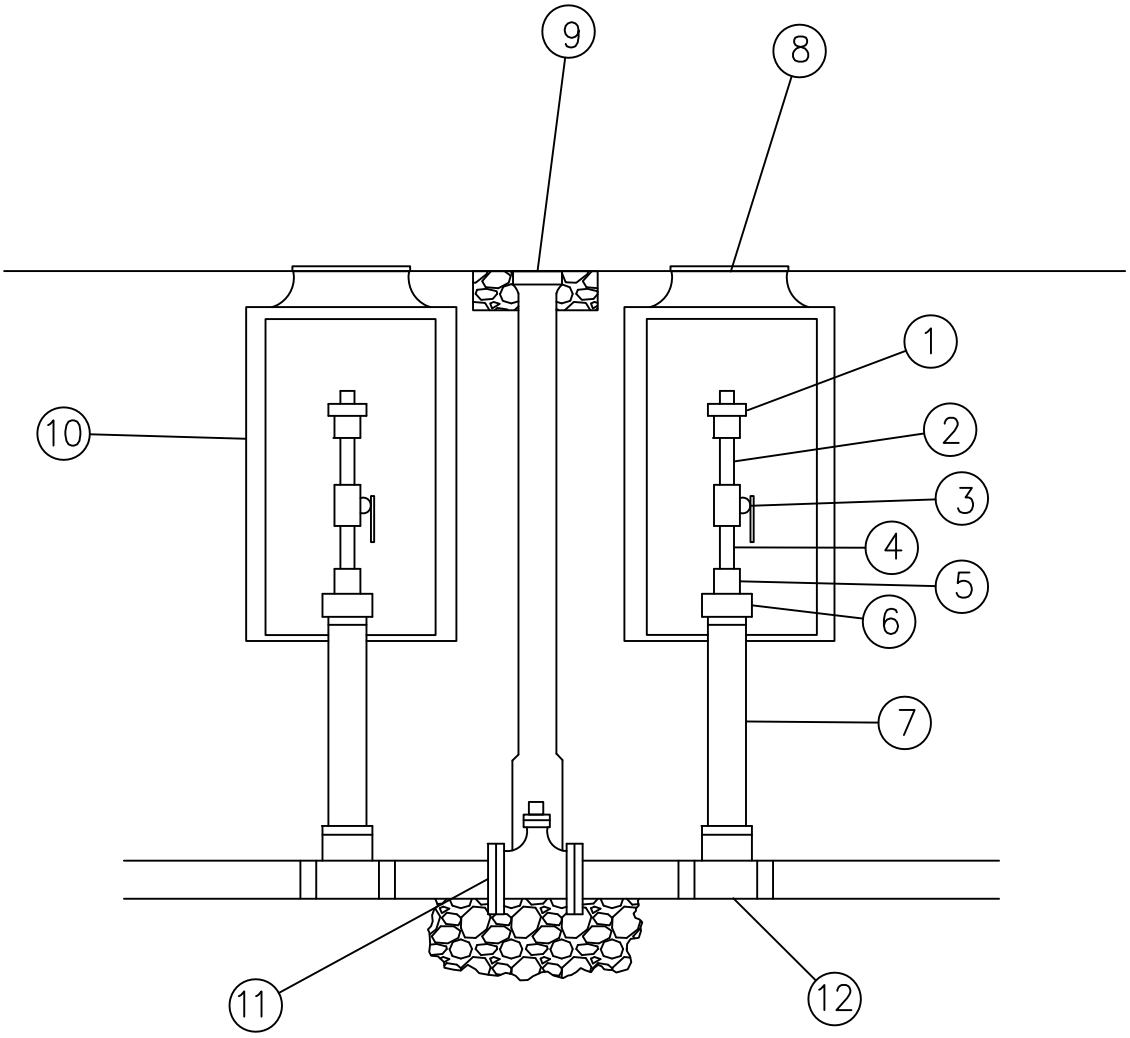
ADJUST DEPTH OF FORCE MAIN AS REQUIRED TO PROVIDE POSITIVE SLOPE (NO AIR ENTRAPMENT) AND TO PERMIT PROPER INSTALLATION OF AIR RELEASE VALVE.

DECEMBER 2004

4.2.5-2

STAFFORD COUNTY DEPARTMENT OF UTILITIES

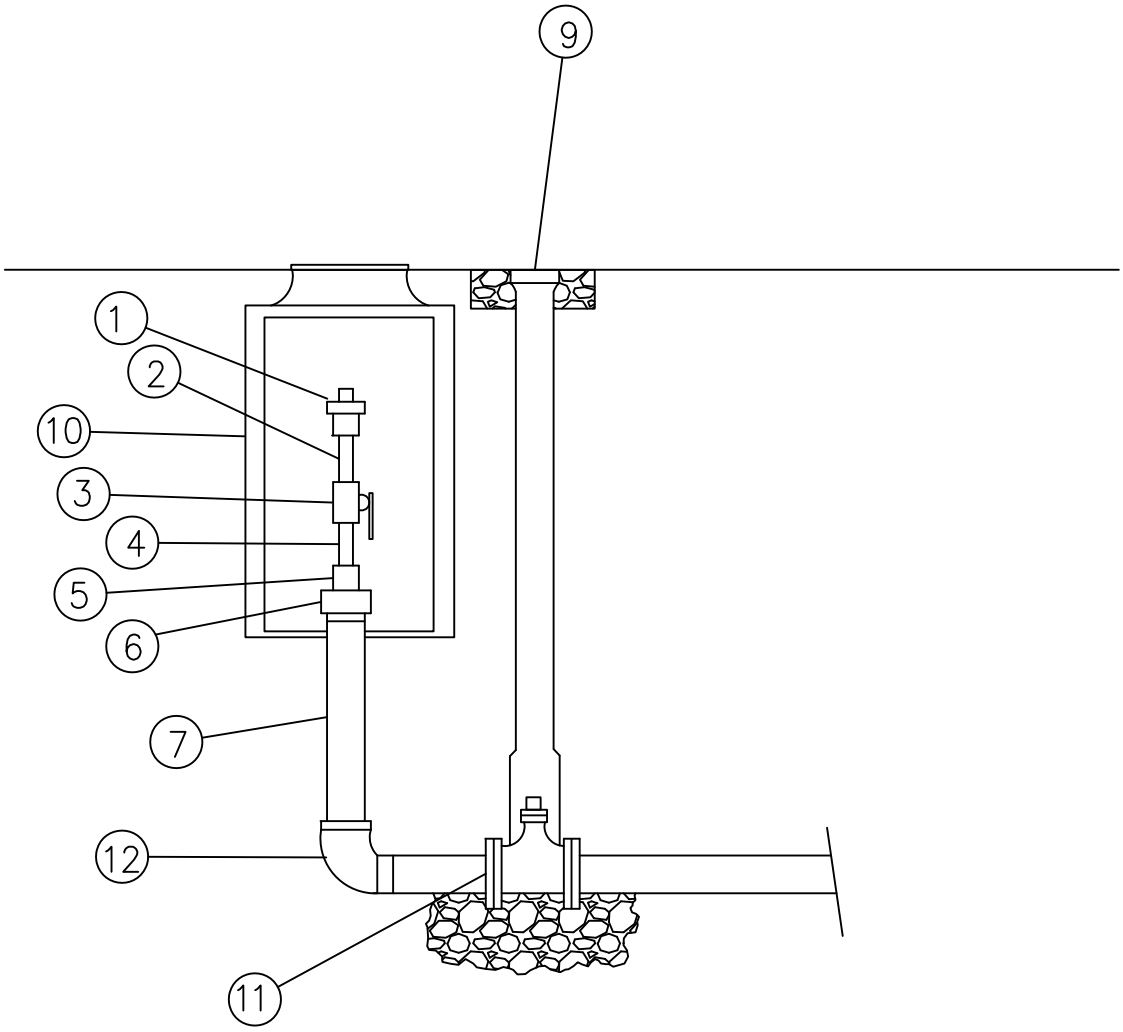
SEWAGE COMBINATION AIR/VACUUM SHORT PATTERN VALVE



INLINE FLUSHING CONNECTION
for
Low Pressure Sewer Systems

1. Brass Union.....1 inch
2. Brass Nipple.....1 inch x 4 inch
3. S.S Hand Valve.....Ball Valve – lever operated 1 inch
4. Brass Nipple.....1 inch x 4 inch
5. Brass Reducer.....2 inch to 1 inch
6. Brass Coupling.....2 inches
7. Brass Nipple.....2 inch x 18 inch
8. Lid – Traffic type if in road way or VDOT right–of–way.
   24 inch Monitor Type – "Sewer on Lid"
9. Valve Box.....5¼ shaft – sliding adjustable
   Lid Must Have The Word SEWER On Top
10. Meter Barrel.....24 inch x 30 inch
11. Valve.....Gate Valve, fully ported size of main line
12. Tee.....size of main line

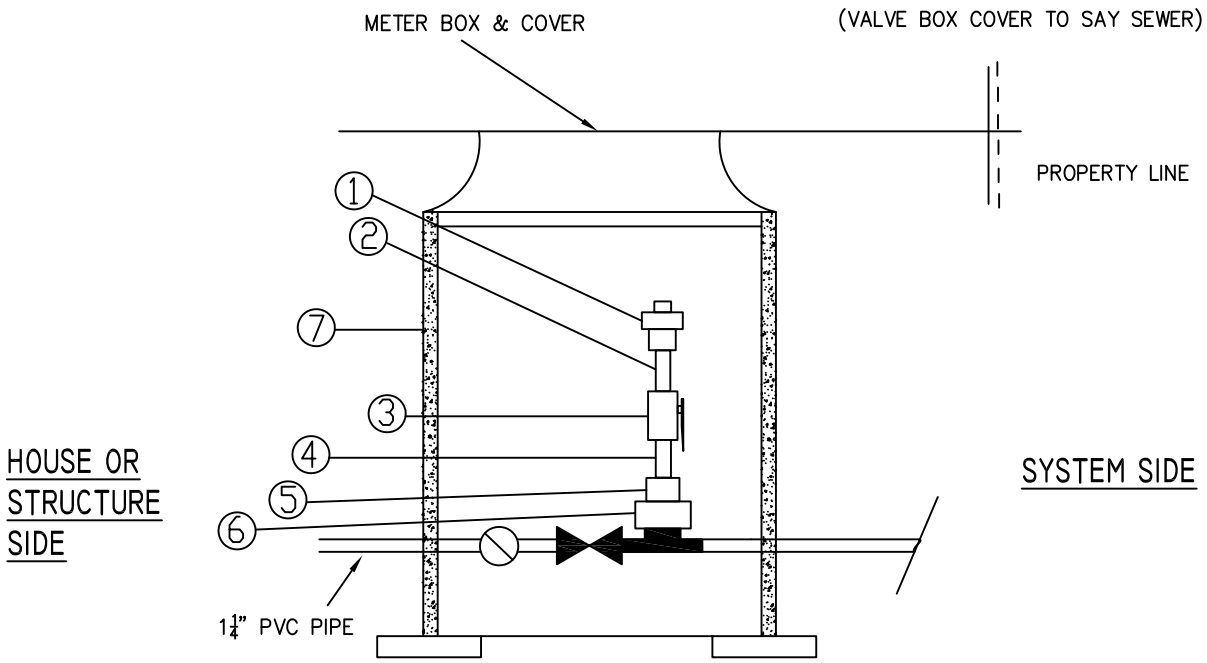
OCTOBER 2016	4.3.1–1
STAFFORD COUNTY DEPARTMENT OF UTILITIES	IN–LINE FLUSHING CONNECTION LOW PRESSURE SEWER SYSTEM



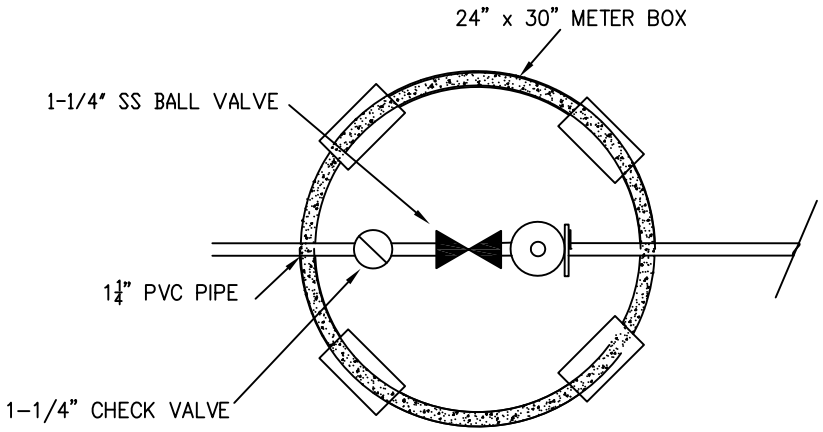
FLUSHING CONNECTION
for Low Pressure Sewer Systems

1. Brass Union.....1 inch
2. Brass Nipple.....1 inch x 4 inch
3. S.S. Hand Valve.....Ball Valve – lever operated 1 inch
4. Brass Nipple.....1 inch x 4 inch
5. Brass Reducer.....2 inch to 1 inch
6. Brass Coupling.....2 inches
7. Brass Nipple.....2 inch x 18 inch
8. Lid – Traffic type if in road way or VDOT right–of–way.
   24 inch Monitor Type – "Sewer on Lid"
9. Valve Box.....5¼ shaft – sliding adjustable
   Lid Must Have The Word SEWER On Top
10. Meter Barrel.....24 inch x 30 inch
11. Valve.....Gate Valve, fully ported size of main line
12. Tee.....size of main line

OCTOBER 2016	4.3.1–2
STAFFORD COUNTY DEPARTMENT OF UTILITIES	TERMINAL CONNECTION FOR LOW PRESSURE SEWER SYSTEM



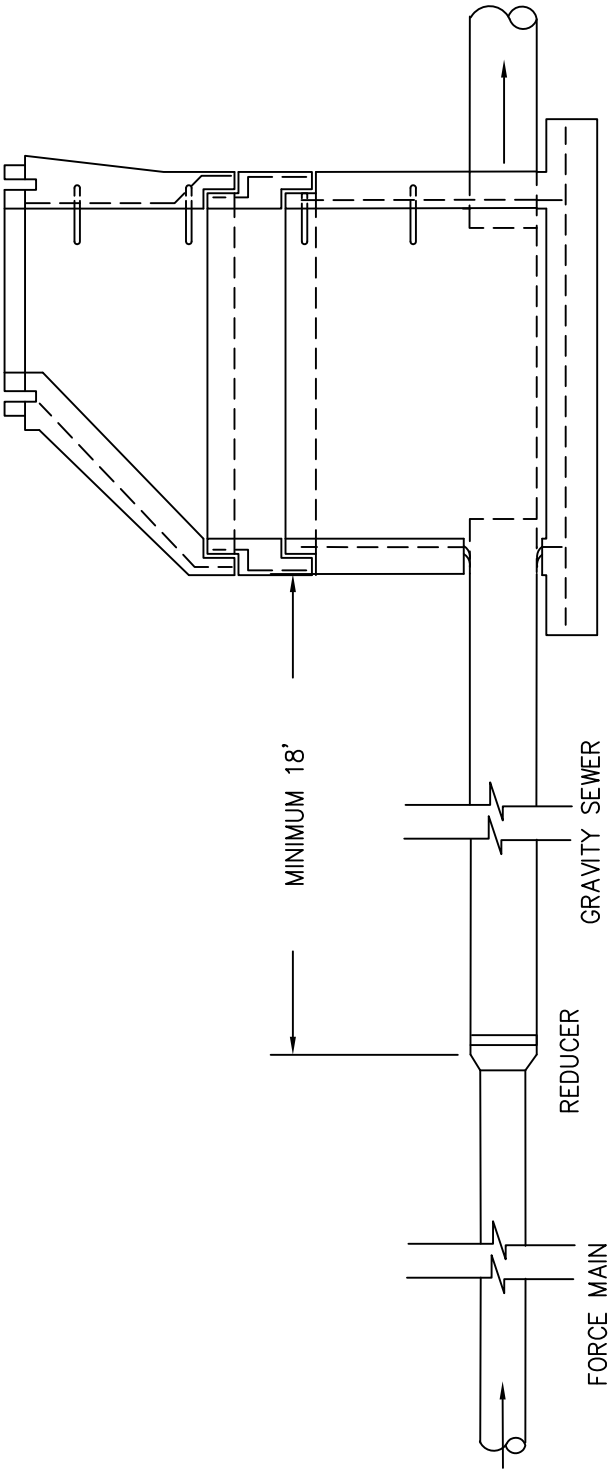
SECTION VIEW



PLAN VIEW

FLUSHING CONNECTION FITTINGS

1. Brass Union.....1"
2. Brass Nipple.....1" x 4" long
3. SS Hand Valve.....Ball Valve - lever operated 1-1/4"
4. Brass Nipple.....1" x 4" long
5. Brass Reducer.....1¼" to 1"
6. Brass Coupling.....1¼"
7. Meter Barrel.....24" x 30"



FORCE MAIN DIAMETER	GRAVITY SEWER DIAMETER
1 1/2"–3"	6"
4"	8"
6"	8"
8"	10"
10"	12"
12"	15"

DECEMBER 2004

4.4.1–1

STAFFORD COUNTY
DEPARTMENT OF UTILITIES

FORCE MAIN CONNECTION
TO GRAVITY SEWER

APPENDIX

WATER METER SIZING FORM
STAFFORD COUNTY, VIRGINIA DEPARTMENT OF UTILITIES
(P) 540-658-8616 (F) 540-658-4599

Project Name:		Project Address:	
Project Engineer:	Tax Parcel:	Site Plan/Project Number:	
Form Completed By: Address:		Company: Telephone: Fax: Email:	

I certify that the information on this form is true and correct.

Owner Name (Print) _____ Telephone:

Signature: _____ Date:

Email:

Failure to return this form will delay processing of your permit application. This form is provided as a means to properly size the water meter(s) serving your property. Please complete this form and fax or email it to attention of:

Aref Etemadi at **aetemadi@staffordcountyva.gov** **or**
Claudia Wright at **cwright@staffordcountyva.gov**

Utilities Department staff will review the form to determine the adequacy of the water meter for the intended use.

A separate form is required for each individual building or space in a building served by a single water meter.

Fill out either Part A or B

For part A enter the number of fixtures. Multiply by the fixture value @ 35psi and enter the result in the fixture valve columns. Sum the results and enter on the combined fixture valve total.

Part A

Fixture		Fixture Value @ 35 psi		No. of Fixtures		Fixture Value
Bathtub		8	x	_____	=	_____
Bedpan Washers		10	x	_____	=	_____
Combination Sink and Tray		3	x	_____	=	_____
Dental Unit		1	x	_____	=	_____
Dental Lavatory		2	x	_____	=	_____
Drinking Fountain	Cooler	1	x	_____	=	_____
	Public	2	x	_____	=	_____
Kitchen Sink	½" Connection	3	x	_____	=	_____
	¾" Connection	7	x	_____	=	_____
Lavatory	⅜" Connection	2	x	_____	=	_____
	½" Connection	4	x	_____	=	_____
Laundry Tray	½" Connection	3	x	_____	=	_____
	¾" Connection	7	x	_____	=	_____
Shower Head (Shower Only)		4	x	_____	=	_____
Service Sink	½" Connection	3	x	_____	=	_____
	¾" Connection	7	x	_____	=	_____
Urinal	-Pedestal Flush Valve	35	x	_____	=	_____
	-Wall Flush Valve	12	x	_____	=	_____
	-Trough (2 Ft. Unit)	2	x	_____	=	_____
Wash Sink (Each Set of Faucets)		4	x	_____	=	_____
Water Closet	Flush Valve	35	x	_____	=	_____
	Tank Type	3	x	_____	=	_____
Dishwasher	½" Connection	5	x	_____	=	_____
	¾" Connection	10	x	_____	=	_____
Washing Machine	½" Connection	5	x	_____	=	_____
	¾" Connection	12	x	_____	=	_____
	1" Connection	25	x	_____	=	_____
Hose Connection (Wash Down)	½"	6	x	_____	=	_____
	¾"	10	x	_____	=	_____
Hose (50 Ft. Wash Down)	½"	6	x	_____	=	_____
	⅝"	9	x	_____	=	_____
	¾"	12	x	_____	=	_____

Combined Fixture Value Total = _____

OR

Part B

(1) Domestic Demand (Verification by County Staff) = _____ gpm

(2) Fixed Load = _____ gpm

(3) Irrigation Demand (From Data Supplied by Site Engineer) = _____ gpm

(4) Total Demand = _____ gpm

(5) Meter Size based on Total Demand (Verification by County Staff) ==========

COUNTY USE ONLY:

Ex Meter Size _____ Account _____ Required Meter Size _____

Sized By: _____ Date _____

Construction Permit

Department of Utilities
Administration 540-658-8630
Field Operations 540-658-8695

I. Project Information

Project Name:_____ **Project Number:**_____

Owner:_____ **WatSew Number:**_____

Address: _____ **Telephone:**_____

_____

II. Owners Application

I, _____, owner of the above project, hereby petition the Stafford County Department of Utilities for permission to construct water and sewer facilities as shown on the approved project documents. I certify that all construction will be in strict conformance with the Stafford County Department of Utilities Water and Sewer Standards and all materials to be used are on the Approved Materials and Manufacturer's List contained therein, unless a deviation is specifically approved in the project documents. I also certify that I have retained _____, P.E. No _____, to certify construction and to provide record drawings.

_____ _____
Signature Date

III. Water and Sewer Utilities Contractor Information

Company _____ Project Manager or Superintendent
Address: _____ Name: _____
_____ Office Telephone: _____
_____ Cell Number: _____

IV. Inspection Fees

Sewer Permit	$ 50.			$
Water Permit	$ 50.			$
Sewer Mains	>= 8"	$150. First 100 Ft Plus	feet at $1.50	$
Water Mains	>= 3"	$125. First 100 Ft Plus	feet at $1.25	$
Force Mains	>= 3"	$125. First 100 Ft Plus	feet at $1.25	$
Internal T.V. Inspection		Sewer Mains	feet at $1.00	$
			Total Fees Due	**$**

V. Approval

The Stafford County Department of Utilities hereby grants the project owner permission to construct the water and sewer facilities shown in the approved project documents for the project identified above. This permit shall become void 12 months from the date of issue if construction has not started or if construction is suspended for a period of 12 months or more. This permit is valid only if signed below and receipted by the County Treasurer's Office in the amount of the construction fees listed above.

_____ _____
Director of Utilities Date

COUNTY OF STAFFORD
DEPARTMENT OF UTILITIES
WATER SYSTEM FLOW ANALYSIS APPLICATION

Requests for water system flow analysis must be made using this form. The following information must be submitted:

Project Name: _____

Project Location: _____

Proposal Type (SF, TH, MF, C): _____

Distance between Buildings (if residential): _____

Point(s) of Connection: _____

Attach a vicinity map indicating the location of the proposed connection(s) to the existing County Water System.
The County will provide computer modeled flows and pressures at the proposed location based upon the existing pip network and existing peak day water demands. The design engineer is responsible for calculating the available flows within the proposed project.

The flow analysis must include the allocation for required domestic demands plus fire demands. For fire demands, the pressure at the demand hydrant cannot be less than 20 psi at any point within the on- or offsite nodes. For domestic demands, the system must be able to supply a minimum of 45 psi to the first floor of each building of the proposed project during a peak hour demand. The analysis must be signed and sealed by a professional engineer.

Requested by: _____

Firm Name: _____

Address: _____

_____

Telephone: _____

E-Mail: _____

Please forward your request to: aetemadi@staffordcountyva.gov or cwright@staffordcountyva.gov

Sanitary Sewer Lateral Schedule																
Connection @ Main					**Lateral from Main to Cleanout at PL or ESMT**						**Lateral from CO at PL or ESMT to pad**					Notes
Lot#	From/To	Main Station	Inv. @ Main	Inv. @ Lateral	Length	Size	Slope	Inv. @ CO	Grd. El @ CO	Depth @ CO	Backwater Valve	Length	Inv. @ pad	FF Elev.	BF Elev.	

CONSTRUCTION NOTES

WATER & SEWER

1. A WATER AND SEWER CONSTRUCTION PERMIT MUST BE OBTAINED FROM THE STAFFORD COUNTY DEPARTMENT OF UTILITIES AT LEAST 48 HOURS PRIOR TO START OF WATER AND SEWER CONSTRUCTION, INCLUDING TAPS TO EXISTING LINES.
2. CONTACT THE DEPARTMENT OF UTILITIES AT 540-658-8630, 48 HOURS BEFORE BEGINNING WORK ON WATER OR SANITARY SEWER UTILITIES, INCLUDING SERVICE TAPS.
3. INSPECTION AND APPROVAL OF ALL WORK AND MATERIALS PERTAINING TO WATER SHALL BE UNDER THE JURISDICTION OF STAFFORD COUNTY, VIRGINIA.
4. ALL WATER LINES AND CONSTRUCTION THEREOF SHALL COMPLY WITH THE STANDARDS AND SPECIFICATIONS OF STAFFORD COUNTY, VIRGINIA AND THE VIRGINIA DEPARTMENT OF HEALTH. ALL SEWER LINES AND CONSTRUCTION THEREOF SHALL COMPLY WITH THE STANDARDS AND SPECIFICATIONS OF STAFFORD COUNTY VIRGINIA AND THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY.
5. USE APPLICABLE STANDARD DETAILS FROM STAFFORD COUNTY WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS.
6. WHEN THE STAFFORD COUNTY WATER AND SEWER DESIGN AND CONSTRUCTION STANDARDS CONTAINS A PROJECT CATEGORY IN THE APPROVED MATERIALS AND MANUFACTURERS LIST, ONLY THOSE PRODUCTS SPECIFICIALLY LISTED MAY BE USED.
7. AFTER A DEPARTMENT OF UTILITIES CONSTRUCTION PERMIT HAS BEEN ISSUED, ALL CHANGES TO WATER AND SEWER FACILITIES TO BE CONSTRUCTED USING THESE PLANS MUST BE SUBMITTED TO THE DEPARTMENT OF UTILITIES IN WRITING AND APPROVED PRIOR TO CONSTRUCTION. CONTACT THE UTILITIES INSPECTION STAFF AT (540) 658-8630.
8. THIS PROJECT IS IN THE ____ PRESSURE ZONE. ANY STRUCTURE THAT HAS A FIRST FLOOR ELEVATION OF LESS THAN ____ WILL REQUIRE A PRESSURE REDUCING VALVE. ANY STRUCTURE THAT HAS A FIRST FLOOR ELEVATION ABOVE ___ WILL REQUIRE A BOOSTER PUMP.

9. CONTACT THE DEPARTMENT OF UTILITIES CROSS CONNECTION/BACKFLOW INSPECTOR AT 540-373-2535 TO COORDINATE THE REQUIREMENTS FOR BACKFLOW PREVENTION.
10. DEVELOPER/OWNER IS RESPONSIBLE TO RESPOND TO MISS UTILITY REQUESTS UNTIL WATER AND SEWER LINES ARE ACCEPTED BY COUNTY. ANY DAMAGE TO WATER AND SEWER MAINS MUST BE REPAIRED BEFORE ACCEPTANCE BY THE COUNTY.
11. THE CONTRACTOR WILL BE RESPONSIBLE FOR DAILY AS-BUILT INFORMATION ON ALL CONSTRUCTION. ALL LATERALS AND APPURTENANCES WILL BE REFERENCED FROM THE CLOSEST MANHOLE. THE CONTRACTOR SHALL MAINTAIN DAILY AS-BUILT DRAWINGS AT THE CONSTRUCTION SITE.
12. WATER AND SEWER IMPROVEMENTS WILL NOT BE ACCEPTED UNTIL THE COUNTY APPROVES AS-BUILT DRAWINGS AND EASEMENTS ARE RECORDED.
13. ALL SERVICES INTERRUPTIONS TO EXISTING WATER AND SEWER CUSTOMERS SHALL BE APPROVED BY AND COORDINATED WITH THE UTILITY INSPECTOR. ALL SERVICE INTERRUPTIONS TO EXISTING CUSTOMERS WILL REQUIRE A MINIMUM OF 48 HOURS NOTICE. CERTAIN SERVICE INTERRUPTIONS MAY REQUIRE WORK AT NIGHT.
14. ALL BACTERIOLOGICAL SAMPLES OF WATER LINES SHALL BE TAKEN BY DEPARTMENT OF UTILITIES PERSONNEL. A MINIMUM OF 48 HOURS NOTICE IS REQUIRED TO SCHEDULE THESE SAMPLES.
15. PVC WATERLINES UP TO 10” DIA MAY BE USED IN NON-PAVED AREAS. PVC WATERLINES SHALL BE CLASS 200 (SDR-14) POLY-VINYL CHLORIDE PIPE MEETING THE REQUIREMENTS OF AWWA C900. WATER PIPE OVER 10” AND ALL WATER PIPE IN PAVED AREAS SHALL BE DUCTILE IRON (CLASS 52) PIPE MEETING THE REQUIREMENTS OF AWWA C151 WITH PUSH-ON OR RESTRAINED MECHANICAL JOINTS. DIP MUST BE POLY ENCASED. PVC PIPE SHALL BE INSTALLED WITH INSULATED 10 GAUGE COPPER CLAD STEEL TRACING WIRE SECURED TO THE TOP OF THE PIPE. ALL PIPE SHALL HAVE BLUE WARNING TAPE BURIED 2’ (TWO FEET) BELOW GRADE OVER THE TOP OF THE PIPE.
16. ALL WATER MAINS SHALL HAVE MINIMUM 42” COVER.
17. ALL SEWER PIPE AND FITTINGS 4” THROUGH 15” DIAMETER SHALL MEET ASTM D3034, SDR 35, MINIMUM. ALL SEWER PIPE AND FITTINGS 18” THROUGH 40” DIAMETER, SHALL MEET ASTM F679.

18. ALL SEWER LINES UNDER PAVEMENT SHALL HAVE A MINIMUM OF 48” COVER. ALL SEWER LINES INSTALLED IN EASEMENTS WITH NO VEHICULAR TRAFFIC SHALL HAVE A MINIMUM OF 36” COVER.
19. DUCTILE IRON SANITARY SEWER PIPE SHALL HAVE INTERIOR LINING OF PROTECTO 401 OR EQUAL AND BE POLY ENCASED, UNLESS NOTED OTHERWISE.
20. ALL MANHOLES IN PAVED AREAS, KEPT LAWNS AND OTHER GREEN AREAS SHALL HAVE STANDARD FRAMES AND SOLID COVERS UNLESS NOTED OTHERWISE. ALL OTHER MANHOLES SHALL HAVE WATERTIGHT FRAMES AND COVERS UNLESS NOTED OTHERWISE.
21. ALL MANHOLES SHALL HAVE FRAMES BOLTED TO CONE, UNLESS DIRECTED OTHERWISE BY THE UTILITIES INSPECTOR
22. TAPERED ADJUSTING RINGS SHALL BE USED TO ADJUST THE SLOPE OF THE MANHOLE FRAME AND COVER TO THE SLOPE OF PAVEMENT.
23. ALL MANHOLES SHALL HAVE A LIQUID APPLIED ELASTOMERIC INTERNAL CHIMNEY SEALING MATERIAL APPLIED.
24. A WATERPROOF MANHOLE INSERT IN CONFORMANCE WITH DETAIL 3.2.3-3 SHALL BE INSTALLED IN EACH MANHOLE WITH A STANDARD FRAME AND COVER.
25. A CLEANOUT COVER ASSEMBLY IN CONFORMANCE WITH DETAIL 3.3.3-3A OR 3.3.3-3B SHALL BE INSTALLED ON EACH SEWER LATERAL CLEANOUT.
26. THERE SHALL BE A 10’ HORIZONTAL SEPARATION BETWEEN WATER LINES AND SEWER LINES, AND A VERTICAL SEPARATION OF 18” BETWEEN THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE SEWER. THIS APPLIES TO HOUSE SEWER LATERALS ALSO.
27. ALL WATERLINE AND SEWER SELECT BACKFILL, STRUCTURAL BACKFILL, AND PIPE BEDDING MATERIAL SHALL BE COMPACTED TO 95% VTM-1 MAXIMUM DRY DENSITY. ALL CONTROLLED FILL IN TRENCHES UNDER PAVEMENT SHALL BE COMPACTED TO 95% VTM-1 MAXIMUM DRY DENSITY.
28. WATER AND SANITARY SEWER DESIGN ELEMENTS, DETAILS AND PRODUCTS SHOWN ON THIS PLAN ARE VALID FOR A PERIOD OF 12 MONTHS AFTER PLAN APPROVAL, AFTER WHICH TIME CURRENT WATER AND SEWER STANDARDS WILL APPLY.
29. WATER AND SANITARY SEWER INFRASTRUCTURE IS SUBJECT TO COMPREHENSIVE INSPECTION AT TENTATIVE ACCEPTANCE, 12 MONTH ANNIVERSARY, AND FINAL ACCEPTANCE.

Water and Sewer-Notes-Administrative

1. Final Inspection

    a. At the completion of this project, the developer or engineer responsible for construction shall notify the Public Utilities Administrator, in writing, that the work has been completed and request a final inspection. This request shall include the requirements of Note 2.

    b. On receipt of the request for final inspection, the Administrator shall make a final comprehensive inspection of the constructed facilities, examining in detail for conformance of the work with approved plans and specification, alignment of sewer lines, infiltration leakage, workmanship, operation of equipment and other factors to the satisfaction of the Administrator and the best interest of the County.

    c. It shall be required that a responsible representative of the developer accompany the Administrator or his designee on the final inspection. The developer shall furnish whatever is necessary for conducting the final inspection.

    d. Deficiencies, which are found to exist during the final inspection, shall be pointed out to the developer. Subsequent to the inspection, the developer shall be furnished, in writing, a summary of the deficiencies found, the correction of which is required. On notification that all construction deficiencies have been completed, the Administrator shall re-inspect all such work.

2. Acceptance by County of Completed Facilities

    a. The Administrator shall accept newly constructed water and sanitary sewer service facilities to become a part of the public utilities system of the County, upon satisfaction of the following conditions.

        1. That, in the opinion of the Administrator, all requirements of Note 1 have been fulfilled or the developer has made arrangements satisfactory to the Administrator to have them fulfilled.

        2. A set of record drawings meeting the requirements of Note 3 has been submitted and approved by the Administrator.

        3. That all matters relative to specific contracts between the developer and the County are in order.

        4. That payment has been made by the developer for all fees relative to applications and inspections.

        5. That a civil engineer registered as a Professional Engineer in the State of Virginia certifies that the work has been completed in accordance with the approved plans and specifications.

        6. That explicit understanding exists between the developer and the Administrator that the developer shall be responsible for and obligated to correct any deficiencies in construction for a period of one year from the date of acceptance of the facilities by the County. This condition shall be stipulated in the written form of acceptance issued by the Administrator.

b. Acceptance of the newly constructed facilities, when approved by the Administrator shall be made, in writing, to the developer responsible for the construction. The issuance of the written forms of acceptance of any such facilities shall constitute and irrevocable agreement between the developer responsible for construction and Administrator that the Board of Supervisors, acting for the County and any of its officers, agents, servants, or employees, shall be saved harmless by the developer from liability and responsibility of any nature and kind for the cost of, or payment on, labor and equipment used in construction of the accepted facilities or on account of any patented or unpatented invention, process, article or appliance manufactured for, or used in construction with, or the intended operation of, the accepted facilities.

c. Certificate of occupancy permits will not be issued for any buildings within the development until the water and sewer facilities have been accepted in accordance with this note.

3. Record Drawings

a. A complete set of Record Drawings and corrected key sheets shall be submitted by the developer responsible for the construction upon completion of construction and at least one week prior to the anticipated occupancy of any building within the project. Record drawings must be determined by actual field survey and sealed by the responsible surveyor or engineer shall be on each sheet, "I hereby state, to the best of my knowledge and personal belief, that the work shown on these plans was constructed to the direction and grades shown and are either installed within the Public right-of-way or properly recorded easements dedicated to Stafford County." The record drawings shall show all revisions, substitutions, variations, omissions, and discrepancies made or discovered during construction concerning location and depth of utilities, piping, manholes, pumps, and other facilities. Revisions shall be made and shown on all drawing views with actual dimensions established to permanent points. The contractor shall keep daily as-built work plans at the construction site and shall furnish them to the design engineer or record drawing preparation.

The record drawings shall show, but may not be limited to, the following:

1. Water Line Construction:
    a. Scale accuracy location in plans of the line and all installed valves and fittings, such as elbows, tees, crosses and reducers, and all cradle encasements or special construction.
    b. Exact measurements to show positive locations shall be taken from at least two reasonably adjacent and available, fixed and permanent objects, such as fire hydrants, centers of sanitary or storm sewer manhole casting covers, corners or lines extending from buildings, power poles, etc.
    c. Type and sizes of all pipes.

2. Sewer Line Construction:
    a. Scale accuracy location of manhole inverts and top casting elevations and numerical notations of the exact elevations of same as

determined by field survey after construction. Elevations shall be in datum of the County.

b. Scale accuracy indication of lengths and grades and direction of lines between manholes and numerical notations of the exact length and grades, as determined after construction.

c. Scale accuracy location of concrete cradles, encasements or special construction.

d. Location of house services by measurement form the manhole immediately downgrades.

e. Type and sizes of all pipes

3. Wastewater treatment facilities and pumping stations, water pumping stations, all other comparable construction and building structures:

    a. As-built plans and specifications shall accurately indicate all approved deviations from or changes in locations or type of equipment installed and material used.

    b. Accurate listings of the name of the manufacturer of all operating equipment installed, together with model or style numbers, ratings, capacities and other pertinent information shall be provided as part of the record plans on the project.

    c. At least three (3) complete sets of operation and maintenance manuals for all operating equipment, materials and the installation thereof, required by the project specifications which are approved by the Administrator, shall be provided as part of the record drawings on the project.

4. When the record drawing information differs from the approved construction plans, a design analysis for the existing conditions may be required.

5. After the record drawings are approved in writing by the Department of Utilities, a set reproducible Mylar and two blue line prints shall be submitted. Projects that include water and/or sewer facilities, which are located within a VDOT right-of-way, will require four additional sets of blue line prints for the remain-in-place permit.

Record Drawing Check Sheet

Record Plan Name _____ A/P Number _____

		Check Items		
		Yes	No	N/A
1.	Record Plan submitted is 24 x 36 with cover sheet?			
2.	PE or LS Seal?			
3.	All inspector punch list items resolved?			
4.	Record plan redrafted with no hand written entries?			
5.	Record conditions conform to approved plans, revisions and field changes?			
6.	Scale consistent with approved plans?			
7.	Connections clearly visible to existing utilities?			
8.	County project AP number on cover sheet?			
9.	Stations labelled on water line plan?			
10.	Contractor name and address on cover sheet?			
11.	Water-Sanitary Sewer deed of easement recording information on cover sheet?			
12.	Phasing map with correct lots and water and sewer lines indicated provided as sheet 2?			
13.	North arrow on plans facing up?			
14.	County coordinates listed on two property corners for each plan sheet?			
15.	New utilities clearly visible as dark bold continuous lines?			
16.	Existing sewer and water lines are bold dashed lines?			
17.	View ports for all above ground W&S apparatuses are shown with measurements to two fixed objects?			
18.	Details viewports for all valves, hydrants, meters, sample stations, manholes, cleanouts?			
19.	Profile on sewer lines show actual length, rim elevation, all inverts and ground elevation?			
20.	Pipe material, material class, and manufacturer listed on water and sewer profiles?			
21.	Sewer lateral – list diameter, material, class and manufacturer, include schedule?			
22.	List in table the XY coordinate locations to all MHs, hydrants, valves Cos, meters and sample stations.			
23.	Plans show easement lines with width labeled, dashed and deed record and plat labeled?			

ATTACHMENT C

APPROVED MATERIALS AND MANUFACTURERS LIST

APPROVED MATERIALS AND MANUFACTURERS LIST

1.1 INTRODUCTION

This section contains the policies and procedures for selecting products for use in the water and sanitary sewer systems in Stafford County Virginia and for maintaining the county's Water and Sewer Design and Construction Standards. The official list of specific products and manufacturers that have been approved for use within the Stafford County water and sanitary sewer system is posted on the Stafford County Web Site on the Department of Utilities Web Page under Utilities Code Compliance, Review & Inspections "Approved Product List." This list is updated on a regular basis to add or remove products as directed by the Product Review Committee of the Stafford County Department of Utilities.

This listing is intended to be used as a reference source for Department of Utilities' employees, contractors, and vendors. Materials produced by manufacturers not listed herein are not acceptable for use within the County's system. Manufacturers interested in submitting products for evaluation and possible approval should submit a written request in accordance with the procedures listed below.

1.2 EVALUATION PROCESS

1.2.1 Product and Design Review Committee

The Product and Design Review Committee will be responsible for:

- Review and approval of the "Approved Materials and Manufacturers List"
- Review and approval of the "Stafford County Water and Sewer Standards"
- Review and response to comments and concerns regarding the Water and Sewer Standards expressed by contractors, engineers, developers, suppliers, etc.
- Review of any other matters regarding the design and construction of the Stafford County water and sewer systems.

The Product and Design Review Committee shall be composed of employees of the Department of Utilities including at least one construction inspector, one member from the field operations staff, and one member from the engineering staff. The Director of Public Works will appoint all members.

The Product and Design Review Committee does not meet on regular basis. Meetings are held when the committee receives a request for new product review from a vendor.

1.2.2 Manufacturers and Products Submission Procedures

A manufacturer requesting review of his product shall complete the following procedures:

A. A written request shall be sent to the Product and Design Review Committee, Department of Utilities, PO BOX 339, Stafford, VA 22555-0339 to the attention of Engineering Manager

B. The request shall include, but not be limited to, submission (thirteen copies of all documents) of the following

1. A list of all applicable standards (AWWA, ANSI, etc.) regarding the product and AWWA, ANSI, etc. certification of the product.
2. Adequate shop drawings and design information (brochures and other product information).
3. Location of the manufacturer's plant.
4. Location of the nearest local distribution point and retail outlet.
5. A list of any special tools, fittings or methods of construction that the product may require for installation and/or maintenance.
6. Spare parts and service availability information.
7. A 5-year history of the product documenting its performance.
8. Warranties.
9. Product sample (where appropriate). Submit one sample only of each product.
10. User references, with contact person and telephone numbers.
11. Life cycle costs.
12. A statement of why the approval of the product would be beneficial to Stafford County.
13. Sample product if possible

The applicant may be requested to make a presentation regarding the product to the committee that shall not exceed 20 minutes. Representatives at the meeting shall be in a position to offer any type of background on product use and locations, design and reference checks. The representative shall also have the authority to approve a trial run in Stafford County.

1.2.3 Design and Construction Submission Procedures

Questions, comments and requests for changes to the Water and Sewer Standards shall be made in writing to the Product and Design Review Committee at the above address. The committee will review each request.

1.2.4 Design Changes

After the Product and Design Review Committee has approved a product, the manufacturer or his representative shall inform the Committee, in writing, of any modifications in design or material. Such changes may require further evaluation and approval of the committee.

1.2.5 Withdrawal of Approval

The Committee may withdraw any approval as a result of a design change, field observation, testing, product failure, or other factors that, in the Committee's opinion, warrant such withdrawal.

1.2.6 Committee Recommendations

After completion of the review, the committee shall discuss the issue until a general consensus is reached. If a consensus cannot be reached, the recommendation shall be deferred to the next committee meeting. All product evaluations are final. Any product that is not approved cannot be resubmitted for at least one year.

For each product that has been submitted, one of the following recommendations will be made:

A. Approval for Use: This approves a product for use throughout the Department's service area. All use of the product will be in conformance with the manufacturer's specifications and good engineering practices.

B. Conditional Approval for Use: This approves a product for use throughout the Department's service area; however, the product will be reviewed periodically to ensure that no unforeseen installation or maintenance problems have risen. After a suitable period of field observation, this approval may be upgraded to **Approval for Use** status. The frequency of review and the length of field observation period will be determined by the Product and Design Review Committee. If, during the field observation period, problems with installation, operation or maintenance of the product are observed, the Product and Design Review Committee may downgrade the status of the product to **Disapproved for Use**. All use of the product will be in conformance with the manufacturer's specifications and good engineering practices.

C. Limited Approval for Use: This approves a product for use only in certain sites or projects with the Department's service area. The Product and Design Review Committee will determine where the product can be used. The product will be reviewed periodically to ensure that no unforeseen installation, operation or maintenance problems have arisen. After a suitable period of field observation, this approval may be upgraded to **Conditional Approval for Use** or **Approval for Use** status. The frequency of review and the length of the field observation period will be determined by the Product and Design Review Committee. If, during the field observation period, problems with the installation, operation or maintenance of the product are observed, the Product and Design Review Committee may downgrade the status of the product to **Disapproved for Use**. All use of the product will be in conformance with manufacturer's specifications and good engineering practices.

D. Disapproved for Use: The product may not be used anywhere in the Department's service area. If a product has been given a **Disapproved for Use** status by the Product and Design Review Committee, the committee will not review the product again unless significant changes have been made to the product. The Product and Design Review Committee will not reconsider a disapproved product until at least twelve (12) months have passed from the date of disapproval.

E. Insufficient Information: Not enough information was provided to evaluate the product. When the Product and Design Review Committee has received additional information, the Committee will evaluate the product at its next regularly scheduled meeting. As part of the request for additional information, the Committee may request a presentation from the manufacturer.

1.2.7 APPROVED PRODUCTS LIST

APPROVED PRODUCTS LIST

DATE: _____ INSPECTOR: _____

PROJECT: _____ CONTRACTOR: _____

POLYVINYL CHLORIDE (PVC) WATER PIPE / MANUFACTURER	
4" TO 10" PVC PIPE / AWWA: C-900 MIN. CLASS DR 14 BLUE	
1) NATIONAL PIPE & PLASTICS	
2) NORTH AMERICAN PIPE	
3) DIAMOND PLASTICS	
4) ROYAL	
5) SANDERSON PIPE	
2" TO 3" PVC PIPE ASTM D 2241, MINIMUM CLASS DR 21	
1) NATIONAL PIPE & PLASTICS	
2) NORTH AMERICAN PIPE	
3) DIAMOND PLASTICS	
4) ROYAL	
PVC RESTRAINED JOINT / AWWA: C-900 MIN. CLASS DR 14 BLUE	
1) DIAMOND PLASTICS & DIAMOND LOK-21 SDR 14	
DUCTILE IRON (DIP) WATER PIPE / MANUFACTURER	
AWWA: C-151 MIN. CLASS 52 PUSH ON OR MECHANICAL JOINT	
1) U.S PIPE & FOUNDRY COMPANY	
2) AMERICAN DUCTILE IRON PIPE	
AWWA: C-150 MIN. CLASS 52 PUSH ON RESTRAINED JOINT	
1) U.S. PIPE TR-FLEX	
2) AMERICAN FLEX-RING RESTRAINED JOINT	
HIGH DENSITY POLYETHYLENE (HDPE) PIPE/MANUFACTURER	
AWWA: C906, PE 3408, MINIMUM SDR 11 CLASS 200	
1) CHEVRON	
2) PLEXCO	
3) FLYING W PLASTICS	
4) PERFORMANCE PIPE DRISCOPLEX 4000/4100	
FIRE HYDRANTS / MANUFACTURER	
AWWA C502 & HYDRANTS SHALL BE FACTORY YELLOW, SHERWIN WILLIAMS INDUSTRIAL URETHANE ALKYD HIGH GLOSS OR MCCORMICK POLYURETHANE MODIFIED ENAMEL 33320	
1) MUELLER CENTURION A423	
2) KENNEDY K81D	
3) AMERICAN FLOW CONTROL B084-B-5	
4) CLOW MEDALLION	
FLUSHING HYDRANTS / MANUFACTURER	
BELOW GRADE	
1) KUPFERLE 2" MAIN GUARD MODEL #85	

ABOVE GRADE	
1) KUPFERLE 2" ECLIPSE MODEL 2	
SAMPLING STATIONS / MANUFACTURER	
1) KUPFERLE ECLIPSE #88	
FOSTER ADAPTERS / MANUFACTURER	
AWWA C153 DUCTILE IRON EPOXY COATED, STAINLESS STEEL ACCESSORIES & PROTECTO 401 INTERNAL COATING FOR SEWER	
1) INFACT	
CORPORATION STOPS: 3/4" – 1" / MANUFACTURER	
AWWA / CC TAPER BY GRIP JOINT, BALL VALVE	
1) FORD: FB-1000-3	
2) FORD: FB-1000-4	
3) MUELLER: B-25008N, ¾" AND 1"	
4) AY MCDONALD 74701 B-22 ¾"	
5) AY MCDONALD 74701 B-22 1"	
6) CAMBRIDGE BRASS 301 NLA383 ¾"	
7) CAMBRIDGE BRASS 301 NLA484 1"	
PIPE RESTRAINTS (DIP) PIPE / MANUFACTURER	
MUST BE UL LISTED AND FM APPROVED	
1) EBAA IRON, INC. (MEGALUG 1100, 1500 AND 2000)	
2) STAR PIPE PRODUCTS, INC. (ALL GRIP & STAR GRIP)	
3) FORD UNI-FLANGE (SERIES 1500 AND 1400)	
4) SIGMA ONE-LOK RETAINER GLANDS C900/C905 AND DIP	
5) ROMAC STYLE 611 (DIP PIPE)	
6) ROMAC ROMA GRIP WEDGE (PVC AND DIP)	
PIPE RESTRAINTS (PVC) PIPE / MANUFACTURER	
MUST BE UL LISTED AND FM APPROVED	
1) EBAA IRON, INC. (MEGALUG 1500, 1900, 19mjOO AND 1500TD)	
2) ROMAC STYLE 611 (PVC PIPE)	
3) ROMAC ROMA GRIP WEDGE	
4) STAR PRODUCTS SERIES 1000	
COMBINATION VACUUM ARV VALVES / MANUFACTURER	
1) DEZURIK / APCO SERIES 140C	
2) GA INDUSTRIES FIGURES 945	
3) ARI NO D-040	
4) ARI NO D-040-6	
5) H-TECH MODEL 993	
DIRECT BURY COMBIN. VACUUM ARV VALVES / MANUFACTURER	
1) H-TECH MODEL 992	
2) H-TECH MODEL 992 FLOOD PROOF OPTION	
AIR RELEASE VALVES / MANUFACTURER	

1) ARI NO D-015	
2) ARI NO D-050	
3) GA INDUSTRIES FIGURES 905, 910	
4) GA INDUSTRIES FIGURES 920. 922	
5) DEZURIK / APCO MODEL 50	
HI-DENSITY POLYETHYLENE PLASTIC BOX / MANUFACTURER	
1) OLD CASTLE	
2) DFW PLASTICS, INC.	
3) BINGHAM & TAYLOR	
18" FRAME AND COVER	
FRAME AND COVER – IFL180118AWA32	
METER PIT MMP182230	
20" FRAME AND COVER	
FRAME AND COVER – IFL18020AWA32	
METER PIT MMP202430	
WATER METER RECESSED TOUCH READ COVERS / MANUFACTURER	
RECESSED WITH TOUCH READ COVERS / ONE HOLE ASTM 48A CLASS 30	
1) AY MCDONALD 74MCL115RG (11.5" LOCKING LID)	
2) AY MCDONALD 74MCL20RG (20" LOCKING LID)	
3) BINGHAM & TAYLOR 180 BTA 32 DP/180 18 A WEH	
4) BINGHAM & TAYLOR / VESTAL VESFL20MFLWS	
BACKFLOW PREVENTER BOX / MANUFACTURER	
POLYESTER ENCLOSURE HEATED & INSULATE ASSE1060	
1) EZ BOX MODEL HEZ	
TRACER WIRE / MANUFACTURER	
#10 AWG COPPER-CLAD STEEL CORE, ASTM D1248 HDPE JACKET BLUE FOR WATER AND GREEN FOR SEWER	
1) COPPERHEAD INDUSTRIES SUPER FLEX	
2) PRO TRACE HF-CCSPE	
TRACER WIRE CONNECTIONS / MANUFACTURER	
1) DRYCONN 3 WAY DIRECT BURY LUG BLUE	
2) COPPERHEAD SNAKEBITE LOCKING CONNECTOR BLUE	
WATERLINE MARKER / MANUFACTURER	
UV RESISTANT FIVERGLASS COMPOSITE: BLUE WITH WHITE LETTERING: CAUTION WATER PIPELINE	
1) CARSONITE INTERNATIONAL SRM306608	
2) RHINO 3 RAIL FIBERGLASS UTILITY MARKER POST	
VALVE BOXES / MANUFACTURER	
CAST-IRON SLIP TYPE ONLY	
1) SIGMA	
2) BINGHAM & TAYLOR	
3) STAR PIPE	

4) VESTAL	
5) EJ IRON WORKS 5-1/4" DROP LID 1.5" SKT WATER	
#8555 10T VALVE BOX SLIP – TYPE TOP	
#8555 16T VALVE BOX SLIP – TYPE TOP	
#8555 26T VALVE BOX SLIP – TYPE TOP	
#8555 24B VALVE BOX SLIP – TYPE BOTTOM	
#8555 30B VALVE BOX SLIP – TYPE BOTTOM	
#8555 36B VALVE BOX SLIP – TYPE BOTTOM	
VALVE BOX SPACERS T O CENTER VALVE / MANUFACTURER	
1) ADAPTOR INC. VALVE BOX ADAPTOR II	
PRECAST CONCRETE VAULTS / MANUFACTURER	
1) CP&P	
2) CLEAR FLOW COMPANY	
3) CONTRACTORS PIPE AND PRECAST CORPORATION	
4) ROTONDO PRECAST	
5) OLD CASTLE	
6) HANOVER	
7) ULTIMA CONNECT BY CUBIS SYSTEMS	
VAULT DOORS / MANUFACTURER	
TYPE K HEAVY DUTY ALUM. DOUBLE LEAF DOOR H20 RATED	
1) BILCO	
2) HALLIDAY	
MODULAR WALL SEAL / MANUFACTURER	
EPDM WITH STAINLESS STEEL NUTS & BOLTS	
1) LINK SEAL BY THUNDERLINE	
WATER FITTINGS / MANUFACTURER	
BENDS, CROSSES, TEES & GRADE-LOC OFFSET GLANDS, DUCTILE IRON ONLY AWWA C-110 & C-153 COMPACT	
1) TYLER PIPE UNION	
2) U.S. PIPE & FOUNDRY COMPANY	
3) SIGMA CORPORATION	
4) STAR PIPE PRODUCTS, INC.	
5) PIPELILNE COMPONENTS, INC.	
COUPLINGS (TRANSITION / STRAIGHT) NON-RESTRAINED	
STAINLESS STEEL BOLTS & NUTS AND OUTSIDE FINISH HEAT FUSED NYLON COATING OR FUSION BONDED EPOXY COATING MIN. 12" LONG BODY	
1) ROMAC 501 SERIES LONG SLEEVE	
2) FORD #FC2A LONG SLEEVE	
3) FORD ULTRA FLEX	
4) DRESSER STYLE 62	
WATER VALVES / MANUFACTURER	
OUTSIDE FINISH: HEAT FUSED NYLON COATING OR FUSION BONDED EPOXY COATING BODY & DISK: DIP OR CIP RESILIENT SEATED GATE VALVES – AWWA C509,SS BONNET BOLTS	

1) KENNEDY (8571 SERIES)	
2) MUELLER A-2361&2362 (RESILIENT WEDGE)	
3) U.S. PIPE – METROSEAL 250	
4) M&H (STYLE 4067)	
5) AMERICAN FLOW CONTROL (C515)	
6) CLOW FIGURE F-6100	
RESILIENT SEATED WEDGE TAPPING VALVES – AWWA C509	
1) AMERICAN FLOW SERIES 2500 RES. WEDGE VALVE	
2) MUELLER T-2360 RES. WEDGE VALVE (6"-12" ONLY)	
3) KENNEDY MODEL 8950 SERIES	
4) CLOW MODEL F6144	
BUTTERFLY VALVES 14" AND GREATER – AWWA C504	
1) MUELLER – LINESEAL III	
2) DEZURIK	
3) M&H – STYLE 4500 & 1450	
INSERTA VALVES / MANUFACTURER	
1) TEAM INSERTA VALVE	
COMPRESSION FITTINGS / MANUFACTURER	
1) MUELLER PACK JOINT	
2) FORD PACK JOINT C-84	
3) AY MCDONALD 22 SERIES	
4) CAMBRIDGE BRASS CAMPAK B NL SERIES FITTING	
VALVE BOX SPACER / MANUFACTURER	
RESILIENT SPACER TO CENTER VALVE BOXES	
1) ADAPTOR INC. VALVE BOX ADAPTOR II	
TAPPING SLEEVES / MANUFACTURER	
STAINLESS STEEL WITH SS BOLTS & NUTS WITH STAINLESS STEEL OR DUCTILE IRON FLANGE – ALL PIPES	
1) ROMAC SST ALL STAINLESS STEEL TAPPING SLEEVE	
2) FORD FTSC (4"-30") W/SS BOLTS	
MJ CAST IRON OR D.I SLEEVE	
1) MUELLER H-615 (4"-24" DIP)	
2) MUELLER H-619 (4"-12" A/C PIPE)	
3) AMERICAN FLOW CONTROL	
MODEL 2800-A FOR A/C PIPE	
MODEL 2800-C FOR 4"-12" DIP & PVC PIPES	
MODEL 1004 FOR PVC PIPE / DIP 16" AND UP	
METER SETTERS 2" / MANUFACTURER	
BALL VALVE INLET & OUTLET, 15" HEIGHT, FIP	
1) FORD VBB77-15B-11-77	
2) MUELLER B-2423	

3) AY MCDONALD 20B715 WWFF 775	
RESTRAINED FITTINGS & COUPLINGS IPS PVC PIPE / MANUFACTURER	
DUCTILE IRON, BITUMINOUS EXTERIOR COATING, DOUBLE CEMENT INTERIOR COATING, NSF 61 APPROVED FOR WATER, FUSION BONDED EPOXY FOR SEWER	
1) HARCO KNUCKLE JOINT RESTRAINT	
COPPER TUBING / MANUFACTURER	
TYPE K (SOFT) ¾" AND 1" SERVICE LINES	
1) CAMBRIDGE LEE	
2) MUELLER STREAMLINE	
3) HOWELL	
4) CERRO	
TYPE K (HARD) 2" AND 3" SERVICE LINES	
1) CAMBRIDGE LEE	
2) MUELLER STREAMLINE	
3) HOWELL	
4) CERRO	
CROSS LINKED POLYETHYLENE / MANUFACTURER	
PEX-A, 1" AND 2" SERVICE LINES	
1) REHAU MUNICIPEX	
SERVICE SADDLES 4" AND SMALLER / MANUFACTURER	
4 BOLT SS W/ FUSION BONDED EPOXY OR NYLON	
1) FORD FC 202 SERIES	
2) FORD FS 202 SERIES (WITH E-COAT)	
3) MUELLER DR2	
4) SMITH/BLAIR, SERIES 317	
5) ROMAC INDUSTRIES, STYLE 202N	
6) JCM INDUSTRIES MODEL 406	
THREADED BALL VLV 2" AND SMALLER / MANUFACTURER	
STAINLESS STEEL BODY AND BALL WITH TEFLON SEAT, NRS WITH STAINLESS STEEL LEVER HANDLE	
1) APOLLO 76FJ-100-A SERIES	
2) MATCO-NORCA 20SSTHM	
3) WATTS SERIES S-FBV-1	
CASING SPACERS , END SEAL & COATING	
1) CASCADE STYLE CCS WITH STYLE CCES END SEALS	
2) PSI MODEL # C8G-2 & MODEL # C12G-2	
3) BMW SS STAINLESS STEEL CASING SPACERS	
4) RACI CASING SPACERS	
5) CCI MODEL CSS STAINLESS STEEL CASING SPACERS	
6) SIKA INERTOL BIYUMINOUS COATING	
7) END SEAL BY GPT MODEL R, PSI MODEL FW OR APPROVED EQUAL	
YOKE BARS / MANUFACTURER	

FOR 5/8" X 3/4" METER	
1) FORD Y502P	
2) MUELLER H-5020P	
3) AY MCDONALD 14-2P	
4) CAMBRIDGE BRASS 461-2	
FOR 3/4" METER	
1) FORD Y-503P	
2) MUELLER H-5030P	
3) AY MCDONALD 14-3P	
4) CAMBRIDGE BRASS 461-2	
YOKE ANGLE METER BALL VALVE 1" / MANUFACTURER	
FOR 5/8" X 3/4" METER	
1) MUELLER B2473N	
2) FORD BA94-324NLW	
3) AY MCDONALD 74602 BY-22 1X3/4X02-CONDITIONAL	
4) CAMBRIDGE BRASS 210NL-B4SR3	
FOR 3/4" METER	
1) MUELLER B2473N	
2) FORD BA94-324NLW	
3) AY MCDONALD 74602 BY-22 1X3/4X02-CONDITIONAL	
4) CAMBRIDGE BRASS 210NL-B4SR3	
YOKE ANGLE DBL. CHECK VALVE 1" / MANUFACTURER	
FOR 5/8" X 3/4" METER	
1) FORD HHCA 94-424NL	
2) MUELLER P 14466AN	
3) AY MCDONALD 7112 4Y2 34	
4) CAMBRIDGE BRASS 500NL-B4SR3	
FOR 3/4" METER	
1) FORD HHCA 94-424	
2) MUELLER P 14466A	
3) AY MCDONALD 7112 4Y2 34	
4) CAMBRIDGE BRASS 500NL-B4SR3	
DOUBLE CHECK, DOUBLE DETECTOR CHECK AND REDUCED PRESSURE PRINCIPLE DEVICES / MANUFACTURER	
AMERICAN SOCIETY OF SANITARY ENGINEERING SEAL APPROVAL, CALL STAFFORD COUNTY BACKFLOW COORDINATOR, (540) 658-5201 FOR SPECIFIC APPLICATIONS	
OTHER WATER PRODUCTS / MANUFACTURER	
VACUUM ARV PEDESTAL, PENCE PLASTIC MODEL AGVNS/1420 HASP BLUE	
GRAVITY SEWER PIPE / MANUFACTURER	
6"-48" PVC C-900/905 Per AWWA standards	
1) NATIONAL PIPE & PLASTICS EVER-GREEN SEWER PIPE	
2) NORTH AMERICAN PIPE ASTM D3034	

3) DIAMOND PLASTICS (PIPE ONLY)	
4) ROYAL (PIPE ONLY)	
5) NORTH AMERICAN F679	
6) SANDERSON PIPE	
7) SANITE HP-HP-PP FOR PIPES LARGER THAN 15"	
D.I. PIPE C-151 MINIMUM – CLASS 52 ACID RESISTANT LINING	
1) U.S. PIPE & FOUNDRY COMPANY (PROTECTO 401)	
2) AMERICAN DUCTILE IRON PIPE (PROTECTO 401)	
PRESSURE SEWER PIPE / MANUFACTURER	
D.I. PIPE CLASS 52 MINIMUM THICKNESS, ACID RESISTANT LINING	
1) U.S. PIPE & FOUNDRY COMPANY (PROTECTO 401)	
2) AMERICAN DUCTILE IRON PIPE (PROTECTO 401)	
PVC AWWA C-900 MINIMUM CLASS DR18 GREEN	
1) NATIONAL	
2) NORTH AMERICAN PIPE	
3) DIAMOND	
4) ROYAL	
RESTRAINED POLYVINYL CHLORIDE (PVC), AWWA C-900 MINIMUM CLASS DR 18 GREEN	
1) DIAMOND LOK-21 RESTRAINED JOINT SDR 18	
HDPE AWWA: C906, PE3408 MIN. SDR11, PR. CLASS 200	
1) CHEVRON	
2) PLEXCO	
3) FLYING W	
4) PERFORMANCE DRISCOPLEX 4000/4100	
PVC FITTINGS: ASTM D1784 / GASKETS: ASTM F477	
1) CHARLOTTE (FITTINGS ONLY)	
2) PLASTIC TREND (FITTINGS ONLY)	
3) MULTI FITTINGS (SDR 35 & SDR 26 FITTINGS ONLY)	
4) VASSALO/SYROCO ASTM D3034 SDR 35 & 26 (FITTINGS ONLY)	
5) VASSALO/SYROCO ASTM D1336 SDR 35 & 26 (FITTINGS ONLY)	
6) HARCO (FITTINGS ONLY)	
7) GPK (GASKETED SEWER PIPE & FITTINGS) SDR 35 & 26	
SEWER CLEANOUT COVER / MANUFACTURER	
1) EAST JORDAN IRON WORKS 8555010/06800006	
2) CAPTIOL FOUNDRY WSSC-C/O	
3) BINGHAM & TAYLOR #8250	
WATERPROOF MANHOLE INSERTS / MANUFACTURER	
NON-CORRODABLE WITH SELF CLEANING GAS & VACUUM RELIEF	
1) RAINSTOPPER – SOUTHWESTERN PACKING & SEALS, INC.	
LIQUID APPLIED ELASTROMERIC LINING / MANUFACTURER	
1) SAUEREISEN F88	

MANHOLE JOINT SEALS / MANUFACTURER	
O-RING GASKET MEETING ASTM C-361 OR ASTM C-443	
1) PRESS-SEAL TYPE 4G GASKET	
2) PRESS-SEAL 4F GASKET	
POLYETHYLENE SLOPE ADJUSTMENT RINGS / MANUFACTURER	
EXPANDED POLYPROPYLENE	
1) CRETEX PRO-RING ADJUSTMENT SYSTEM	
2) EJ INFRA-RISER	
SANITARY SEWER MARKER / MANUFACTURER	
UV RESISTANT FIBERGLASS COMPOSITE, WHITE WITH GREEN LETTERING: CAUTION SEWER PIPELINE	
1) CARSONITE INTERNATIONAL SRM306601	
2) RHINO 3 RAIL FIBERGLASS UTILITY MARKER POST	
LATERAL BACKWATER VALVE / MANUFACTURER	
DIAPHRAM OPERATED SS KNIFE VALVE ASME A112.14.1	
1) SMITH FLODGATE FIGURE 7140Y	
MANHOLE INTERIOR COATING / MANUFACTURER	
HIGH BUILD ACID RESISTANT TWO COMPONENT POLYMER LINING SYSTEMS APPLIED BY APPLICATOR CERTIEFIED BY MANUFACTURER AND APPROVED BY COUNTY.	
1) RAVEN 405	
2) SAUEREISEN SEWERGUARD 210S, 210RS	
3) VERSAFLEX 50 DM POLYUREA COATING SYSTEM	
4) BELZONA 5811 IMMERSION GRADE	
MH EXTERIOR BITUMINOUS COATINGS / MANUFACTURER	
1) SHERWIN WILLIAMS TARGUARD COAL EPOXY	
2) SEABOARD ASPHALT PRODUCTS MP 33 INDUST. MASTIC	
MODULAR WALL SEAL / MANUFACTURER	
EPDM WITH STAINLESS STEEL NUTS & BOLTS	
1) LINK SEAL BY THUNDERLINE	
SADDLES & INSERTING TEE / MANUFACTURER	
1) ROMAC STYLE CB SEWER SADDLE	
2) INSERTA TEE	
TRACER WIRE / MANUFACTURER	
#10 AWG COPPER-CLAD STEEL CORE, ASTM D1248 HDPE JACKET BLUE FOR WATER & GREEN FOR SEWER	
1) COPPERHEAD INDUSTRIES SUPER FLEX	
2) PRO TRACE HF-CCSPE	
VACUUM AIR RELEASE VAULTS / MANUFACTURER	
POLYMER CONCRETE WITH BOLT DOWN 48" BY 60"; DEPTH & MOUSE HOLE AS REQUIRED. MARKED "WATER" OR "SEWER" AS REQUIRED; STAINLESS STEEL BOLTS	
1) ARMORCAST	
MANHOLES - PRECAST / MANUFACTURER	
ASTM C478, WITH RUBBER O-RING GASKET	

1) WINCHESTER PRECAST – WBS	
2) CONTRACTORS PRECAST – CP&P	
3) TINDALL PRECAST	
4) FREDERICK PRECAST CONCRETE	
5) CP&P	
6) CP&P MONOITHIC MANHOLE	
MANHOLE FRAME & COVERS / MANUFACTURER	
ASTM A48, CLASS 35B, AASHTO M-306 STANDARD SOLID FRAME & COVER	
1) EAST JORDAN IRON WORKS	
#00194410 STANDARD MANHOLE FRAME	
#00194443 STANDARD MANHOLE LID	
2) CAPITOL FOUNDRY MH-1682	
3) U.S. FOUNDRY MH-1682	
HEAVY TRAFFIC SOLID COVER	
1) EAST JORDAN IRON WORKS #1930-A	
WATERTHIGHT FRAME AND COVER	
1) EAST JORDAN IRON WORKS	
#00194412 W/T MANHOLE FRAME	
#00194441 W/T COVER	
2) U.S. FOUNDRY	
MANHOLE STEPS / MANUFACTURER	
1) AMERICAN STEP COMPANY	
2) M.A. INDUSTRIES	
INTERNAL CHIMNEY SEALS / MANUFACTURER	
1) SAUEREISEN F88	
N/A IF USING THE CRETEX PRO-RINGS	
GASKET & FLEXIBLE MANHOLE CONNECTION / MANUFACTURER	
FLEXIBLE CAST-IN-PLACE SEAL OR FLEXIBLE BOOTS INSTALLED WITH HYDRAULIC PRESSURE AFTER MANHOLE MANUFACTURE. MANHOLE OPENINGS MADE BY HOLE-FORMERS, INSERTED DURING MANUFACTURE. FIELD INSTALLED – MUST BE INSTALLED BY PERSONNEL CERTIFIED BY MANUFACTURER OR UNDER DIRECT SUPERVISION OF THE MANUFACTURER'S REPRESENETATIVE.	
1) PRESS-SEAL GASKET CORP. PSX POST. SEAL GASKET	
2) A-LOK	
3) INTERNATIONAL PRECAST SUP. WITH SS ADJUSTABLE	
4) NPC KOR-N-SEAL SL	
5) HAMILTON KENT – CIB CAST IN BOOT CONNECTOR	
6) HAMILTON KENT MIB MECHANCALLY INSTALLED	
MANHOLE JOINT WRAP / MANUFACTURER	
1) WRAPID SEAL	
2) BUTYL-TITE MULTISEAL, INC.	
MANHOLE JOINT SEALER BUTYL MASTIC / MANUFACTURER	

1) RAM NEK PIONEER 310 MASTIC	
SEWER VALVES / MANUFACTURER	
VALVES – PLUG, FULL PORT	
1) DEZURIK FIG 100	
2) CLOW ECCENTRIC PLUG VLVE C5413	
VALVES – RESILIENT SEATED GATE AWWA: C509	
1) MUELLER A-2360 (RESILIENT WEDGE)	
2) U.S. PIPE – METROSEAL 250	
3) M&H STYLE 4067	
4) AMERICAN FLOW CONTROL (C515)	
5) CLOW FIGURE F-6100	
6) KENNEDY 1106 SERIES	
SWING CHECK VALVES / MANUFACTURER	
1) GOLDEN ANDERSON FIGURE 250-D	
2) KENNEDY 1106 SERIES	
BACKWATER VALVES – MANHOLE VENT / MANUFACTURER	
1) JOSAM 67100	
COMBINATION AIR & VACUUM VALVES / MANUFACTURER	
1) H TECH MODEL 986	
2) ARI 020 & 025 STAINLESS STEEL	
BALL VALVE 1" OR 1 ¼" FIP/LPSS / MANUFACTURER	
1) FNW FIGURE 200A	
2) APOLLO 76FJ-100-A SERIES	
CHECK VALVE 1 ¼" LPSS / MANUFACTURER	
LPSS HOUSE CONNECTION – 2-INCH BRASS BODY & FLAPPER, FIP	
1) FNW 16B 200K	
VAULT DOORS / MANUFACTURER	
TYPE K HEAVY DUTY ALUMINUM DOUBLE LEAF DOOR H20 RATED	
1) BILCO	
2) HALLIDAY	
TRACER WIRE CONNECTIONS / MANUFACTURER	
1) DRYCORN 3 WAY DIRECT BURY LUG	
2) COPPERHEAD SNAKEBITE LOCKING CONNECTOR	
MANHOLE INVERT REPAIR / MANUFACTURER	
1) KAUFMAN HICAP PATCHING & FINISHING COMPOUND	
VACUUM AIR RELEASE VALVE RISER / MANUFACTURER	
C900 TAPPED SERVICE TEE; 316 STAINLESS STEEL / HDPE TRANSITION; GF NYLON ADAPTER & BALL VALVE	
1) HARCO C900 SERVICE TEE 351-XXX	
2) HARCO TRANSITION NIPPLE 65-283202	
3) HARCO MALE ADAPTER 75-33088	

4) HARCO BALL VALVE 76-70308	
LPFM BOX COVERS / MANUFACTURER	
1) EAST JORDAN	
2) Bingham and Taylor	

Attachment A - Pricing Sheet

IMPORTANT PLEASE READ: The Pricing sheet is for a select group of materials out of a larger catalog of materials. The description below under each heading includes types of materials that will be procured as needed. Materials shall be based on standards (AWWA, ANSI, ASTM, VDOT, etc.) and product certifications (UL, ASSE, etc.). Within the purchase of the catalog the Manufacturer, shop drawings, specifications and any other pertinent information that is needed by the County should be listed.

IMPORTANT BIDDING INSTRUCTIONS FOR BASIS OF BID ON COMPLETING THE FORM: The Bidder will only populate the cells in Yellow. The Bidder shall return this EXCEL form completed with only the yellow cells completed in the EXCEL document.

Item	Part Description	Specification	Estimated Quantity	Unit of Measure	Unit Price	Bid Amount
PIPING	Not all water and sewer pipes are made of the same material. This category covers ALL piping, apparatuses (repair clamps, fittings, accessories, coatings, couplings, fittings, gaskets, transition fittings, repair kits, mega lugs, installation tools, facilitatory parts, etc) that is within the manufacturer's catalog for water and sewer materials that meets AWWA guidelines and the County of Stafford Utilities specifications and standards.					
1	8" Ductile Iron Class 52	AWWA C151-17 AWWA C150	1	EA	$ 100.00	$ 100.00
2	Schedule 40 PVC - 6" diamater	ASTM D1784 ANSI NSF 61	8	LF	$ 200.00	$ 1,600.00
3	C900 PVC Pipe - DR18 (235 psi)	AWWA C900-07 ASTM D3139	8	LF	$ 200.00	$ 1,600.00
4	Repair Clamp 6 inch length - 12" Nominal Diameter	AISI 304 / 304L ASTM A351-CF8	1	EA	$ 400.00	$ 400.00
					Sub Total	$ 3,700.00
VALVES & HYDRANTS	Valves shall be compatable with the material and installation practices from AWWA and the County of Stafford. **Fire Hydrants are restricted to ONLY Muller and Kennedy Hydrants**. For all Valves (all sizes) and Hydrants, repair clamps, flange repair kits, collision repairs, nut repair, packing, fittings, nuts, various valves (sizes & types), tapping sleeves, saddles, backflow preventers, water sampling stations and all other parts within are covered with this IFB. There are other hydrants within the system, that will require parts and repair kits, which shall be covered under this IFB.					
1	6 inch Ball Valve	AWWA C507-18	1	EA	$ 100.00	$ 100.00
2	8 inch Resilient Wedge Valve	AWWA C500-19	1	EA	$ 200.00	$ 200.00
3	Muller Dry- Barrel Fire Hydrants	Muller A-421 HP AWWA C502-18	1	EA	$ 300.00	$ 300.00
4	Kennedy Dry- Barrel Fire Hydrants	Kennedy A81A AWWA C502-18	1	EA	$ 400.00	$ 400.00
					Sub Total	$ 1,000.00
METER & SERVICE HARDWARE	This is for the installation and maintenance of meters and apparatus within the County. Parts are not limited to service hardware for the distribution, testing and sampling of water and/or wastewater within the distribution and collection system.					
1	Reduced Pressure Backflow Prevention	ASSE 1013	1	EA	$ 100.00	$ 100.00
2	Curb Stop	ANSI/AWWA C800	1	EA	$ 200.00	$ 200.00
3	Corporation Stop Ball type with a rating of 300 psi	ANSI /AWWA C800	1	EA	$ 300.00	$ 300.00
4	Copper Tubing - 3/4" dia., Soft Coil (length of 8')	ANSI /AWWA C800 Type "K" Soft Copper	1	EA	$ 400.00	$ 400.00
					Sub Total	$ 1,000.00
STRUCTURES	This includes Meter Barrels, Concrete Pre-Cast Concrete Manhole Structures, Vaults, Curb Stop boxes, Composite, Plastic and Steel Lids, Frames and accessories (monitor ports, flanges, linings, concrete, mortar, connections, couplings, protective coatings, seals, locks, bolts, etc.). All materials placed within the public road right-of-way shall meet VDOT Materials Specifications.					
1	Bringham & Taylor 12.5" Recess Lid and Frame for Meter Barrel	B&T 1FL180BTA32DP ASTM A48	1	EA	$ 100.00	$ 100.00
2	Bringham & Taylor 18" x 30" Molded White Interior Plastic Meter Barrel	B&T MMP1830 AASHTO Class 25	1	EA	$ 200.00	$ 200.00

3	Valve Box , with a shaft of 5" nominal dia. Height of 5' Must be listed within VDOT Manufacture's / Distributors QA/QC program	ASTM A48 AASHTO M 105, Class 35B	1	EA	$ 300.00	$ 300.00
4	Manhole - 5' in diameter with a minimum of 4,000 psi at a compressive strength at 28 days. Bid includes Standard Base, Riser(s), and 1-Cone. No stairs within the structure. Include rubber gasket between parts. The frame and cover shall be gray cast iron. The depth is a height of 6' from the bottom of the base to the frame /cover.	ASTM C478 / AASHTO M199 ASTM 185 ASTM A615 VDOT Section 105 & 302 ASTM C443	1	EA	$ 400.00	$ 400.00
					Sub Total	$ 1,000.00
EQUIPMENT, GENERAL USE & MISCELLANEOUS PRODUCTS All items that are associated with the installation, testing, tools and materials for utilities. There is no limit within this category of items and covers all items not covered in general in the preceding categories.						
1	Decteable Identification Warning Marking Tape, 6" wide, 4 mils thick, yellow (wording optional for bid). 1,000 ft roll	ASTM D-2103 ASTM D-882 Method A	1	EA	$ 100.00	$ 100.00
2	Non-Metalic Marker Posts. 54" Blue Tracer Pedestal with 3 deals on the post	N/A	1	EA	$ 100.00	$ 100.00
3	Polyethene Encasement - 4 mil, thick cross - laminated high density polyethlene flat tube to fit over a 8" ductile iron pipe. Assume a length of 16'	ANSI A21.5 AWWA C105	1	EA	$ 100.00	$ 100.00
4	Magnesium Anodes - weight of 17 lbs, 25 ' long and D Shaped (2.5" by 3.5" x 3.5")	ASTM B 843	1	EA	$ 200.00	$ 200.00
					Sub Total	$ 500.00

The Vendor shall provide an overall Average Percentage Catalog Discount:	**AVERAGE PERCENTAGE CATALOG DISCOUNT**

CALCULATION OF BID

Total Bid Price:	$ 7,200.00