PROJECT MANUAL

SUFFOLK PUBLIC SCHOOLS

STORM SEWER IMPROVEMENTS
VARIOUS SITES

IFB Bid No. 1781
February 17, 2022

Prepared by:

MSA, P.C.
5033 Rouse Drive
Virginia Beach, VA

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INVITATION TO BID

Date: February 17, 2022

Owner: Suffolk City School Board
User: Suffolk Public Schools
Engineer: MSA, PC
Project: Storm Sewer Improvements – Various Sites
Suffolk Public Schools Bid # 1781

Suffolk Public Schools is soliciting sealed bids for the construction work related to storm sewer improvements and pavement repairs at various Suffolk Public School s sites. It is also the intent to establish a term contract/contracts for emergency and non-emergency projects that are needed for the school division.

All bids must be submitted in a sealed envelope or package clearly marked **"BID 1781 - Storm Sewer Improvements," including the due date and time**. All bids shall be received in the Purchasing Office, on or before **2:00 PM., March 8, 2022** and delivered to:

Anthony W. Hinds, CPPB
Department of Purchasing
Suffolk Public Schools
100 North Main Street (entrance @ rear of building)
Suffolk, Virginia 23434

Bids shall be publicly opened and read aloud at the above stated date, time and location. Any bid received after the time designated above will be returned unopened.

Any award resulting from this solicitation will be issued to the successful offeror in writing and will be posted on the Suffolk Public School Bid Board located at 100 North Main Street, Suffolk, Virginia 23434 and the Suffolk Public Schools website.

A bid bond is not required as this is a term agreement. Procedures for submitting a bid, claiming an error, withdrawal of bids, and other pertinent information are contained in the contract documents. The procedure for withdrawal of bids shall be in accordance with the Instructions to Bidders and Section 2.2-4330, Code of Virginia. Bidders shall be required to comply with the provisions of Section 2.2-4311, Code of Virginia, in regard to nondiscrimination in employment. The owner reserves the right to reject any or all bids. This bid will be in accordance with the Virginia Public Procurement Act.

Questions must be submitted by no later than February 25, 2022 at 3:00 pm. Due to the nature of this project, competition is being sought under a compressed time period.

Any questions regarding this invitation to bid should be directed in writing to Anthony W. Hinds, Purchasing Manager at the above address or emailed to anthonyhinds@spsk12.net and Greg Hayes at Greg.Hayes@msaonline.com.

END OF INVITATION TO BID

SECTION 002113 - INSTRUCTIONS TO BIDDERS

The intent of this Invitation to Bid is to allow for as much competition practicable for emergency and non-emergency sewer improvements at various sites. Suffolk Public Schools reserves the right to award a contract to a number of contractors, starting with the lowest responsive and responsible bidder but also to other bidders to allow for emergency repairs to take place in a timely manner. Nothing herein requires Suffolk Public Schools to use this contract for non-emergency matters and the public body may solicit project specific bids for projects that do not need immediate attention. Bidders may bid on all or some of the items on the bid form.

SCOPE OF SERVICES REQUESTED

To provide all labor, materials, and incidentals necessary for storm structure and pipe repairs including asphalt and concrete patching on an as-needed basis. The contractor will be responsible for, but not limited to, saw-cutting, removal and proper disposal of any excess or removed materials, compaction of asphalt, soil, stone, subbase, and subgrade materials, placement of structures, pipe, bituminous asphalt, compaction testing and reporting. Work may also require select undercutting and backfilling to address unsuitable conditions along with other grading and incidental work. The awarded bidder will also be responsible for the safe maintenance and control of traffic at the work site. Suffolk Public Schools reserves the right to award multiple contracts, and to perform all, part, or none of the work.

1. DRAWINGS AND SPECIFICATIONS:

   Drawings and specifications may be obtained from the Purchasing Office at Suffolk Public Schools, 100 North Main Street, Suffolk VA 23434 or the Suffolk Public Schools Purchasing website at www.spsk12.net. This package will also be published to the EVA purchasing site. Drawings and specifications in this Invitation to Bid are designed to demonstrate the type of systems that exist to help determine if the bidders desire to bid this term project. Each school is different and the pricing arrangement will be on time and materials.

2. BIDS:

   Before submitting a bid, each bidder shall carefully examine the drawings, specifications and other Contract Documents; read and understand the bidding documents and shall include in the bid the cost of all labor, supervision, items, materials, systems, and equipment described and included in the Contract Documents without exceptions.

3. CONTRACT AND BONDS

   As this is a term contract, it is not required for bidders to respond with bonds as set forth in Virginia Code Sections 2.2-4336 and 2.2-4337. However, during the term of this agreement should any project exceed the statutory limits found in Virginia Code Sections 2.2-4336 and 2.2-4337, bonds will be required. Bonds will be priced into the price quoted using the bid pricing and will be added expense that will be paid by Suffolk Public Schools.

   It is important that potential bidders maintain sufficient bonding capacity should a large project arise that requires bonding.

4. QUALIFICATION OF CONTRACTORS

   Each bidder shall submit with the bid a completed Contractors Qualification Statement using AIA Document A305, 1986 Edition (a copy is included after the Supplementary General Conditions).

   Bidders are required to submit with the bid evidence of proper and current certificates of contractors' registration in Virginia.

5. LISTING OF SUBCONTRACTORS

The experience and responsibility of subcontractors may have bearing on the choice of a contractor by the Owner.

If required by the Owner, the apparent two low bidders shall deliver to the Owner within seventy-two (72) hours (not including Saturday, Sunday or State Holidays) for review the following information:

a. Provide a list of the work to be performed by the bidder with his own forces.
b. Provide the proprietary names and the suppliers of the principle parts (items, systems, materials, and equipment) proposed for the work.
c. Provide a list of the names of the subcontractors to be employed for each of the principal parts of the work, copies of their agreements, and their corresponding dollar amounts.
d. Provide a list of references and/or past projects for individual subcontractors performing a principal part of the work. This requirement applies to subcontractors at any tier.

Principal part shall mean a subcontract dollar value in excess of $10,000.00.

The bidder will be required to establish the reliability and responsibility of the proposed subcontractors, manufactures, and suppliers who shall furnish and perform the work described in the specifications to the satisfaction of the Engineer and the Owner.

These lists shall be binding upon the Contractor; however, the Owner has the right to reject any or all subcontractors which the Engineer and the Owner determines to be unqualified to do the work. Owner may withhold awarding a contract to any particular bidder if the Owner considers one or more of the proposed contractors to be unqualified.

6. INTERPRETATIONS OF PLANS AND SPECIFICATIONS

If any person contemplating the submission of a bid for the proposed Contract is in doubt as to the true meaning of any part of the drawings, specifications or other proposed contract documents, he/she may submit a written request to Anthony Hinds at anthonyhinds@spsk12.net or Greg Hayes at Greg.Hayes@msaonline.com. Requests must be in writing and received no later than February 22, 2022 at 3:00 PM for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addendum. Any mention of brand names in this Invitation to Bid is to demonstrate the type and quality Suffolk Public Schools wishes to obtain in the repair work. Substitutions will be acceptable upon the written scope for each repair. The Owner and the Engineer will not be responsible for any other explanations or interpretations of the proposed documents. The attached specifications are to demonstrate the type of repairs that exist in our systems. Each system may differ as we attempt to establish a term agreement and to seek competition for emergency repairs.

7. ADDENDA OR BULLETINS

Addenda or bulletins will be published to the Suffolk Public Schools Purchasing website (www.spsk12.net). Every bidder is required to acknowledge receipt of each addenda as part of their bid. Any addendum or bulletin issued during the time of bidding shall become part of the documents provided to the bidders for the preparation of the bid, shall be covered in the bid, and shall be made a part of the Contract. No addenda will be issued later than four (4) days prior to the date for receipt of bids except an addendum, if necessary, postponing the date for receipt of bids or withdrawing the request for bids.

8. RIGHT TO NEGOTIATE

The Owner reserves the right to negotiate with the lowest responsive and responsible Bidder to obtain a Contract price with funds available to the Owner whenever such low bid exceeds the Owner's availability of funds for the work.

9. AWARD OF CONTRACT

The Owner intends to award this contract in writing to the lowest responsive and responsible bidder for each of the bidder areas provided the bid has been submitted in accordance with the requirements of the bid and contract documents, Virginia procurement regulations, [which are judged to be reasonable] and does not exceed the funds available. The public body also reserves the right to award multiple contracts, in the event the lowest, responsive and responsible bidder is not be available to handle an emergency need. The bidder will be responsible for providing the services at their bid award price and this may be Notice of Award will be posted on the Suffolk Public Schools Bid Board, located

on the second floor of the School Administrative Building, 100 North Main Street, Suffolk, VA 23434 and on the Suffolk Public Schools website.

The Owner reserves the right to waive any informality in any bid or in the bidding. The accepted bidder shall assist and cooperate with the Owner in preparing a formal Contract Agreement and within five (5) days following its presentation shall sign and deliver four (4) complete sets of Contract Agreement documents to the Owner, including but not limited to: the Agreement, the Performance Bond, Payment Bond [if required] Hold Harmless Agreement, and all necessary Certificates of Insurance.

The successful bidder, upon failure or refusal to enter in the Contract and/or to furnish the required Performance Bond, Payment Bond, [if required] and other required documents within the time specified, shall pay to the Owner as liquidated damages, an amount equal to the bid guarantee deposited with the bid or a portion thereof equal to the difference between the bid security and the next highest acceptable bid.

10. TIME IS OF THE ESSENCE

Time is of the essence for this Contract. ~~As~~ Many of the current repairs are emergency in nature. The School Board is issuing this written Invitation to Bid in order to obtain as much competition as possible due to the nature of some of these repairs. These repairs may be required in order to prevent imminent risk of injury to persons or property. It is important that potential bidders have the capacity to respond within 24 hours of having received a request for services.

11. RESPONSIBLE BIDDER

The Owner reserves the right to award a contract or contracts as may be in the Owner's best interest and to award to the lowest responsive and responsible bidder. In determining the "lowest responsible bidder" Suffolk Public Schools may consider the following:

a. Past performances of the contractor and subcontractors that indicate their ability to complete this project (includes organization, equipment available and any other indicators)
b. Whether the bidder can perform the contract or provide the service promptly, or within the time specified, without delay. Past performance may be an indicator of abilities.
c. Quality of products used and adherence to bid specifications
d. The sufficiency of financial resources and the ability of bidder to perform the contract
e. The previous and existing compliance by the bidder with laws and ordinances
f. The quality of performance of previous contracts or services

In addition, the Owner reserves the right to reject any or all bids or to negotiate with the low bidder in the case of insufficient funds.

12. COST BREAKDOWN

The Contractor shall, before starting his work, will submit to the Owner and/or Engineer the cost of the work including all anticipated man-hours and materials prior to the work being authorized (if under time and materials portion). If job is in outlined items on the bid form, the cost per foot will be applied to the job.

13. RIGHT TO REJECT BIDS

The Owner reserves the right to reject any or all bids, in whole or in part; to waive informalities; and/or to delete items prior to making an award; whenever it may be deemed by the Owner to be in the Owner's best interest.

14. BID BOND OR CHECKS OF SUCCESSFUL BIDDERS

Bid bonds are not required as this is a term contract. This doesn't preclude a bidder from having to provide performance and payment bonds should an individual job meet the requirements set out in Virginia Code Section 2.2-4337.

15. REVSIONS TO BID

Handwritten or typed notes on the envelope containing the bid will not be accepted as authorized modifications to the Bid Form included herein. The bid amount indicated on the Bid Form will be the only data considered.

16. WITHDRAWAL OF BIDS

Bids may be withdrawn by written or telegraphic request received from bidders prior to the time fixed for the bid opening. Telegraphic requests must be received by the Owner in written form before the bid opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened except as permitted in Section 2.2-4330 of the Code of Virginia as outlined below.

A bidder may withdraw his bid from consideration if the price bid was substantially lower than the other bids due solely to a mistake in the bid, 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, whereby the unintentional arithmetic error or unintentional omission 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.

The bidder must give notice in writing of his claim of right to withdraw his bid within two (2) business days after the conclusion of the bid opening procedure. This notice to the Owner must be accompanied with his original work papers, documents, and materials used in the preparation of the bid. Such work papers shall be delivered to the Owner by the bidder in person or by registered mail.

Such mistake shall be proved only from the original work papers, documents, and materials delivered to the Owner as required herein.

Failure of bidder to submit his original work papers, documents, and materials used in the preparations of this bid at the time, date and place required, shall constitute a waiver of bidders' right to claim a mistake in his bid.

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.

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.

If the bid is withdrawn under authority of this section, the next lowest responsive and responsible bidder shall be deemed to be the low bidder on the Project.

When the procedure set forth in the paragraphs above is utilized, original work papers, documents, and materials used in the preparation of the bid must be submitted in an envelope or package separate and apart from the envelope containing the bid marked clearly as to the contents.

17. BID PROCEDURE/AWARD/COORDINATION OF WORK

1. Prices and information must be turned in on the bid form and must be legible. If the bid is not legible, then Suffolk Public Schools reserves the right to disqualify the bid.
2. The School Board will notify the successful bidder in the form of a Purchase Order or Notice of Award and will post the Bid Award on Suffolk Public schools Bid Board located on the Second Floor in the School Administration Office at 100 N. Main Street, Suffolk, Virginia 23434.
3. The School Board reserves the right to reject any or all bids in whole or part and to waive any informalities if, in its judgment, it is in the best interest of the School Board. When bids are requested on individual items and also on a total sum of sums, the School Board reserves the right to award bids on individual items OR on total sums as may be in the best interest of the School Board.
4. In case of tie bid with all other factors deemed equal with two or more suppliers, preference will be given in the following order: Suffolk City firms, area firms, state firms; otherwise the tie will be decided by lot.

5. The School Board reserves the right to make awards within ninety (90) days after the date of the bid opening during which period bids may not be withdrawn unless the bidder distinctly states in the bid that acceptance thereof must be made within a shorter specified time.
6. In submitting a bid, the bidder obligates his company to furnish items at the bid price and that written notice from the School Board accepting the bid constitutes a contract between the bidder and the School Board. The School Board reserves the right to adjust original quantities.
7. The successful bidder(s) will be notified of a need by the Facilities Department and they will be dispatched to the site. The bidders will provide a non-binding quote of time and materials (in accordance with their bid) and will obtain approval. Upon completion of the job, the contractor shall provide documentation of time and materials used in the execution of the work along with final invoicing
8. Payment of invoicing will take place on 30-day terms. Every attempt will be made to pay prior to 30 days, but no penalty can be assessed prior to 30 days net after the receipt of invoice with all documentation.

END OF INSTRUCTIONS TO BIDDERS

IFB 1781 Storm Sewer Improvements – Various Sites
BID FORM

This bid is for the **Storm Sewer Improvements – Various Sites**

Each bidder shall submit their bid on this form. Submit two (2) copies of this form completed and with original signatures.

To: **Anthony W. Hinds, CPPB**
Department of Purchasing
Suffolk Public Schools
100 North Main Street
Suffolk, Virginia 23434

From: _____
(Name)

_____
(Address)

_____

Having carefully examined the bid documents including the Invitation to Bid, Instructions to Bidders, Specifications, Drawings, Terms of Agreement and Addenda (if any) prepared by the owner and the Owner's representatives, entitled:

"Storm Sewer Improvements- Various Sites"

as well as the premises and conditions affecting the work, the undersigned proposes to furnish all labor, supervision, materials, equipment, and services necessary to perform all the work in accordance with the contract documents for the following amount. You can bid any of the three or all three of the areas (CCTV/Cleaning/Flushing, CIPP lining, and Time/materials. Each category may be awarded and multiple awards per category is allowed under this Invitation for Bids.

UNIT PRICE BID:

The unit price for **Cleaning, Flushing and Closed-Circuit Television Video (CCTV)** of storm sewer pipes, including time, materials, equipment and any allowances, completed within the time limits as specified by the Owner and in accordance with the contract documents.

Provide unit cost per linear foot of the following:

1. 8-inch pipe:.....$ _____ per foot.
2. 10-inch pipe:.....$ _____ per foot.
3. 12-inch pipe:.....$ _____ per foot.

4. 15-inch pipe:.....$ _____ per foot.
5. 18-inch pipe:.....$ _____ per foot.
6. 24-inch pipe:.....$ _____ per foot.
7. 30-inch pipe:.....$ _____ per foot.
8. 36-inch pipe:.....$ _____ per foot.
9. 42-inch pipe:.....$ _____ per foot.
10. 48-inch pipe:.....$ _____ per foot.
11. 54-inch pipe:.....$ _____ per foot.
12. 60-inch pipe:.....$ _____ per foot.

The unit price for **Cured-in-Place Pipe (CIPP) Lining**, including time, materials, equipment and any allowances, completed within the time limits and in accordance with the contract documents.

Provide unit cost per linear foot of the following:

1. 8-inch pipe:.....$ _____ per foot.
2. 10-inch pipe:.....$ _____ per foot.
3. 12-inch pipe:.....$ _____ per foot.
4. 15-inch pipe:.....$ _____ per foot.
5. 18-inch pipe:.....$ _____ per foot.
6. 24-inch pipe:.....$ _____ per foot.
7. 30-inch pipe:.....$ _____ per foot.
8. 36-inch pipe:.....$ _____ per foot.
9. 42-inch pipe:.....$ _____ per foot.
10. 48-inch pipe:.....$ _____ per foot.
11. 54-inch pipe:.....$ _____ per foot.
12. 60-inch pipe:.....$ _____ per foot.

Time and Materials Category

The remaining Storm Sewer Improvements at various sites will be based on Time and Materials for all of the remaining work in this package, including time, materials, equipment, completed within the time limits as specified by the Owner and in accordance with the contract documents.

Cost per man hour $_____per hour (primary basis of award)

Overtime per man hour $_____per hour

Fixed markup on materials _____%

Additional prices may be added on a separate sheet. Multiple awards are possible in order for the public body to have ample resources to respond to emergencies.

ADDENDA:

The above stated bid is based on the Contract Documents and the following additional addenda issued subsequent to the release of the drawings and specifications for bids. (List all addenda with dates, if issued. If no addenda are issued, write the word "none".)

Addenda # _____ Date _____ Addenda # _____ Date _____

Addenda # _____ Date _____ Addenda # _____ Date _____

TERMS OF THE AGREEEMENT:

The initial term of the agreement will start from the date of award and will continue until June 30, 2023. After which, the contract will be automatically renewed for up to four one-year terms. Either party may terminate the automatic renewals provided that written notice is received by May 1 of each year. Annual price increases may be contemplated based on the Consumer Price Index, Southern Region and any increases need to be received by Suffolk Public Schools no later than May 1 of each year.

BID SECURITY/OTHER SECURITIES:

As this is a term agreement, bid security is not required. However, other securities may be required during the term of this agreement such as payment and performance bonds. It is incumbent on the contractor to maintain sufficient bonding capacity should that be required due to the size of the assignment.

BID FORM SIGNATURE(S):

The Undersigned declares that this firm is (check one):

- ❑ A Corporation organized and existing under the laws of _____.
- ❑ A Partnership consisting of _____.
- ❑ A sole Proprietorship.
- ❑ Other _____.

Virginia State Corporation Commission ID #_____

It is agreed, that the Undersigned has complied with and/or will comply with all requirements concerning licensing and with all other Local, State, and National laws and that no legal requirement has been, or will be, violated in making or accepting this proposal, in awarding the contract to him, and/or in the prosecution of the work required therein.

The Undersigned declares that the person, or persons, signing this proposal is/are fully authorized to sign the proposal on behalf of the firm listed and to fully bind their firm listed to all the conditions and provisions thereof. It is agreed that no person, persons, or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal of the Contract that may be entered into as a result thereof and that in all respects the proposal is legal, fair, and submitted in good faith without collusion or fraud.

Respectfully submitted this _____ day of _____, 2021.

_____
(Name of Firm)

_____
(Address)

_____ *Affix Seal*

Telephone (____)_____ Fax (____)_____

Email address _____

Registered Virginia Contractor #: _____ (Please attach a copy of the registration)

By: _____
(Signature)

Name: _____
(Printed)

Title: _____ *Affix Seal*
(Printed)

END OF BID FORM

Sample Agreement

Suffolk City School Board
Bid # 1781 Storm Sewer Improvements – Various Sites

THIS AGREEMENT, made and entered into this _____ day of _____, 2021 by and between the Suffolk City School Board, (hereinafter called the Owner), whose address is 100 N Main Street, Suffolk, VA 23434 and _____ (hereinafter called the Contractor), whose address is _____.

WITNESSETH: WHEREAS, the Owner intends to contract the construction of sewer upgrades at _____

WHEREAS, the Contractor agrees to perform the work for the sum herein stated.

NOW THEREFORE, the Owner and the Contractor agree as set forth below.

ARTICLE 1. SCOPE OF WORK

The work to be performed shall be in accordance with **IFB 1781**and all related Contract Documents prepared by MSA and Suffolk Public Schools dated February 17, 2022 and entitled **"Storm Sewer Improvements – Various Sites"**. The Contractor agrees to furnish all labor, materials, equipment and supervision to complete the work as required in the Contract Documents, which are hereby made a part of this contract by reference. It is understood and agreed by the parties hereto that all work shall be performed as required in **IFB 1781** and related Contract Documents and shall be subject to inspection and approval by the Owner or its authorized representative. The relationship of the Contractor to the Owner hereunder is that of an Independent Contractor. The Contract Documents are defined in the General Conditions and are incorporated herein by reference.

ARTICLE 2. TIME OF COMPLETION

The Contractor shall commence the work promptly upon the date established in the Notice of Award or Notice to Proceed.

ARTICLE 3. CONTRACT SUM

The Owner agrees to pay based on the bid amounts per hour and percentage of markup.

ARTICLE 4. PAYMENT

The Owner agrees to pay the Contractor as the work progresses, but not more frequently than once each month after the date of the Notice of Award or Notice to Proceed, and only after fully complying with the General Conditions and completion of an acceptable Certificate of Payment for the work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and, subject to the requirements of the General Conditions, ninety-five percent (95%) of the value of materials furnished in place or on-site.

The Contractor shall supply such evidence of labor performed and materials furnished as the Owner may desire, at time of request for the Certificate of Payment of account. Materials for which payment has been made cannot be removed from job site.

Retainage Reduction – Five percent (5%) of the earned amount shall be retained from each monthly payment until fifty percent (50%) of the dollar amount of the Contract has been earned. During the last fifty percent (50%) of the Contract, retainage may be reduced pursuant to applicable provisions of the General Conditions.

Should work be completed inside of 30 days, then Suffolk Public Schools will release payment in full.

ARTICLE 5. INDEBTEDNESS

Before final payment is made, the Contractor must submit evidence in the form of a final waiver of lien or claim to the Owner that all payrolls, materials bills, subcontracts and outstanding indebtedness in connection with the work have been paid or what arrangements have been made for their payment.

Payment will be made without unnecessary delay and after receipt of such evidence as mentioned above and final acceptance of the work by the Owner.

ARTICLE 6. ADDITIONAL WORK

It is understood and agreed by the parties hereto that no money will be paid to the Contractor for any additional labor or materials furnished unless a new contract in writing or a modification hereto for such additional materials or labor has been executed by the Owner and Contractor. The Owner specifically reserves the right to modify or amend this Contract and the total sum due hereunder either by enlarging or restricting the scope of work.

ARTICLE 7. ACCEPTANCE

The work shall be inspected for acceptance by the Program Manager and Architect promptly upon receipt of notice from the Contractor that the work is complete and ready for inspection.

ARTICLE 8. DISPUTES PERTAINING TO PAYMENT FOR WORK

Should disputes arise regarding the value of any work done, or any work omitted, or of any extra work which said Contractor may be required to perform, or respecting any other elements involved in this Contract, said dispute shall be brought to the attention of the Program Manager who will endeavor to settle matters. If he/she is unsuccessful, the dispute will be brought to the attention of Suffolk Public Schools and its decision shall be final and conclusive.

ARTICLE 9. TERMINATION FOR BREACH, ETC.

If the Contractor shall be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his subcontractors violate any of the provisions of this Contract, the Owner may serve written notice upon him of its intention to terminate said Contract; and unless, within ten (10) days after the serving of such notice, such violation shall cease, the Owner then may take over the work and prosecute same to

completion by contract or by any other method it may deem advisable for the account and at the expense of the Contractor. The Owner may take possession of and utilize in completing the work, such materials, equipment, and any other property belonging to the Contractor as may be on the site of the work and necessary, therefore. The Owner may, at any time upon ten (10) days written notice to the Contractor, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the work for the convenience of the Owner.

ARTICLE 10. OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE APPLICATION THEREOF

The Owner may withhold from payment to the Contractor such an amount or amounts as, in the Owner's sole judgment, may be necessary to pay just claims against the Contractor or any subcontractor for labor and services rendered and materials furnished in and about the work. The Owner may apply such withheld amounts on the payment of such claims in its sole discretion. In so doing, the Owner shall be deemed the agent of the Contractor and payments so made by the Owner shall be made by the Owner under the terms of the Contract and in good faith and no liability whatsoever shall attach to the Owner for having made such payments. Such payments may be made without prior determination by the Owner of the validity of any claim or claims.

ARTICLE 11. LIABILITY AND INDEMNIFICATION

The Contractor agrees that it shall at all times protect and indemnify and save harmless Suffolk Public Schools, the Suffolk City School Board and all institutions, agencies, departments, authorities and instrumentalities of Suffolk Public Schools, the School Board and any member of the School Board or of their boards or commissions or any of the elected or appointed officers or any of their employees or authorized volunteers as described in the General Conditions of the project specifications which are included herein by reference, from any and all claims, damages of every kind and nature made, rendered or incurred by or in behalf of any person or corporation whatsoever, including the parties hereto and their employees that may arise, that occur or grow out of any acts, actions, work or other activity done by the said Contractor in the performance and execution of this Contract.

ARTICILE 12. SUBCONTRACTOR

No part of this Contract shall be sublet by the Contractor without prior written approval of the Owner.

ARTICLE 13, NONDISCRIMINATION

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 any 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 nondiscrimination 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.

The contractor will include the provisions of the foregoing paragraphs a, b and c in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

Suffolk Public Schools does not discriminate against faith-based organizations.

ARTICLE 14, DRUG FREE WORKPLACE

During the performance of this contract, the contractor agrees to:

a. Provide a drug-free workplace for the contractor's employees,
b. 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,
c. State in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace,
d. Include the provisions of the foregoing clauses in every subcontract or purchase order of over $10, 000 so that the provisions will be binding upon each subcontractor or vendor.

ARTICLE 15, CONTRACTOR/EMPLOYEE BACKGROUND CERTIFICATION

Upon award, the contractor and any employee who will have direct contact with students shall provide certification that (i) he has not been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child; and (ii) whether he has been convicted of a crime of moral turpitude.

Any person making a materially false statement regarding such offense shall be guilty of a Class 1 misdemeanor and, upon conviction, the fact of such conviction shall be grounds for the revocation of the contract to provide such services and, when relevant, the revocation of any license required to provide such services. **(Included)**

ARTICLE 16, STATE CORPORATION COMMISSION ID NUMBER

In accordance with new registration requirements effective July 1, 2010, the Contractor shall include the identification number issued by the State Corporation Commission as proof of registration or justification for non-registration per the requirements in Section 13.1 or Title 50 of the Code of Virginia.

SCC ID #_____

ARTICLE 17, COMPLIANCE WITH FEDERAL IMMIGRATION LAW

The Contractor shall not, during the performance of a contract knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

SIGNATURE PAGES

IN WITNESS WHEREOF, the parties have caused the Agreement to be executed by the following duly authorized officials.

SUFFOLK CITY SCHOOL BOARD,
A Body Corporation

By: _____
Superintendent
Suffolk City Public Schools

NOTARY CLAUSE

Commonwealth of Virginia

City/County_____, to wit: The following instrument was

Acknowledged before me this _____day of _____, 2021 by _____
Name

_____, _____, and
Name Title

_____, _____.
Name Title

My commission expires:_____

Notary Number:_____

_____
Notary Public

Contractor

By: _____
Signature

_____
Print Name

_____
Title

NOTARY CLAUSE

Commonwealth of Virginia

City/County_____, to wit: The following instrument was

Acknowledged before me this _____day of _____, 2021 by _____
Name

_____, _____, and
Name Title

_____, _____.
Name Title

My commission expires:_____

Notary Number:_____

_____
Notary Public

APPROVED AS TO FORM AND CONTENT:

_____
School Board Attorney

SECTION 010100 - DRAWING INDEX

CIVIL – STORM SEWER IMPROVEMENTS – VARIOUS SITES

DETAILS OF STORM SEWER IMPROVMENTS.....1 - 43

END DRAWING INDEX

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices for UNFORESEEN CONDITIONS ENCOUNTERED DURING CONSTRUCTION.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment:

1. Quantities will be calculated jointly by the Owner's independent testing agency, the Engineer, and the Contractor. Quantities shall be calculated by actual units or amounts such as, area and depth of excavation to be removed and/or filled. There will be no additional provisions or payments for "swell or shrink" factors.
2. All work shall be observed by the Owner's testing agency and/or the Owner's designated on site representative. Approval of additional work will be provided by the Owner and or Engineer based on the recommendations of the Owner's testing agency.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

SCHEDULE OF UNIT PRICES

A. Unit Price Item 1: Removal of unsatisfactory soil and disposal off site.

1. Description: Unsatisfactory soil excavation and disposal off site for unforeseen conditions, according to Section 312000 "Earth Moving for Sitework"
2. Unit of Measurement: Cubic yard of soil excavated.
3. Bid Quantity: 100 CY
4. Unit Price: $35.00/CY

B. Unit Price Item 2: Placement and compaction of VDOT #57 stone for utility trenches.

1. Description: Placement and compaction of additional bedding course for undercut for unforeseen conditions, according to Section 312000 "Earth Moving for Sitework."
2. Unit of Measurement: Tons of stone placed.
3. Bid Quantity: 100 Tons
   Unit Price: $40.00/Ton

C. Unit Price Item 3: Place and compact satisfactory fill from off-site borrow.

1. Description: Backfill and compaction of soil fill for structures, pavements, walks, and utilities for unforeseen conditions, according to Section 312000 "Earth Moving for Sitework."
2. Unit of Measurement: Cubic yard of soil placed.
3. Bid Quantity: 100 CY
4. Unit Price: $35.00/CY

END OF SECTION 012200

SECTION 312000 - EARTH MOVING FOR SITEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Subbase course for concrete walks.
4. Subbase course and base course for asphalt paving.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Engineered Fill layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Preexcavation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements in Adjoining Right-of-Way: Authority for performing work indicated in the adjoining right-of-way will be obtained by Owner.

C. Utility Locator Service: Notify "Miss Utility" for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 31 Section "Site Clearing," are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups SP, SP-SM AND SM with less than 20 percent fines, according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GW, GP, GM, SP, GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve. Engineered Fill material shall be coordinated with the structural design.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: See Engineered Fill.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Detectable Trace Wire:

1. Install electrically continuous trace wire to be used for locating pipe with an electronic pipe locator after installation.

2. Trace wire to be fourteen (14) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place and compact initial backfill of subbase material , free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

F. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be connected to surface features such as hydrants, valve boxes, or other.

G. The wire shall be installed in such a manner as to be able to properly trace all water mains without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

H. At the point of connection between cast or ductile iron water mains, with any non iron water main, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an

approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of 2 inches thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.

I. Tracer wire shall be laid flat and securely affixed to the pipe at 10 foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 :

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 100 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Contractor shall determine quantities of cut and fill in order to grade site to elevations shown on the Civil Drawings. Any excess material will be removed from the site in accordance with this section. Any imported material needed to bring site to grades shown on the Civil Drawings shall be approved by the Geotechnical Engineer prior to bringing such material on site. Importation of soil or removal of soil, in order to bring site into conformance with site plan grades and elevations, is included in this contract and no additional compensation shall be considered by the Owner's Representative.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.

4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

G. Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or Owner's representative. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION 312319

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.2 INFORMATIONAL SUBMITTALS

A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.

PART 3 - EXECUTION

3.1 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.2 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.3 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

3.5 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

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SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.

2. Asphalt surface treatments.

3. Pavement-marking paint.

B. Related Sections:

1. Division 31 Section "Earth Moving for Sitework" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with Virginia Department of Transportation VDOT Standards and Specifications, Latest Edition and the City of Suffolk, Department of Public Works, Public Facilities Manual.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

b. Review condition of subgrade and preparatory work.

c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.

2. Tack Coat: Minimum surface temperature of 60 deg F.

3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Base Course Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand VDOT standard Type I Size 21A or 21B Aggregate.

C. Base Course Aggregate: Crushed concrete having a gradation equivalent to VDOT standard Type I Size 21A or 21B stone.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 17 (ASTM D 242).

E. Asphalt Cement: VDOT standard SM-9.5A surface mix, BM-25 base mix.

F. Tack Coat: VDOT standard RC-250, applied at 0.10 gal. per square yard of surface.

G. All pavement message markings shall be VDOT approved Type B, Class VI markings. All other pavement markings shall be VDOT approved Type B, Class I Thermoplastic with and alkyd binder. All pavement markings shall be reflectorized.

H. Reclaimed Asphalt Pavement (RAP) material may be used as a component material of asphalt mixtures in conformance with VDOT standards and the following:

1. The final asphalt mixture shall conform to the requirements for the type specified.

2.2 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Paving Geotextile: AASHTO M 288, nonwoven poly propylene; resistant to chemical attach, rot, and mildew; and specifically designed for paving applications.

C. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M248, colors complying with FS TT-P-1952.

1. Color: as indicated.

D. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.

1. Color: as indicated.

E. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II.

1. Color: as indicated.

F. Pavement-Marking Paint: MPI#97 Latex Traffic Marking Paint.

1. Color: as indicated.

G. Glass Beads: AASHTO M 247, Type 1.

H. Wheel Stops: Precast, air-entranced concrete, 2500-psi minimum compressive strength, size as indicated on the plans. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.

2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 PAVING GEOTEXTILE INSTALLATION

A. Apply tack coat uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd..

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.

1. Protect paving geotextile from traffic and other damage and place hot-mix asphalt paving overlay the same day.

3.5 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.

2. Place hot-mix asphalt surface course in single lift.

3. Spread mix at minimum temperature of 250 deg F.

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent nor greater than 100 percent.

2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F.

1. Asphalt Mix: Same as pavement surface-course mix.

3.9 Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch .

2. Surface Course: 1/8 inch .

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.11 PAVEMENT MARKING

A. Cleaning: Sweep surface clean to remove all loose material and dirt.

B. Do not apply traffic and lane marking paint until layout and placement has been verified with Architect/Engineer.

C. Pavement markings shall be installed in accordance with the regulations governing the design, location, and operation of all official traffic signs, signals, and markings on and along highways within the Commonwealth of Virginia.

D. The contractor shall prepare the pavement surface for the proper adhesion. Any sweeping or removal of debris, gravel, dirt, or other foreign materials shall be considered as incidental to the installation.

E. The contractor shall remove completely all previous pavement markings which, in the opinion of the Architect/Engineer, conflict with the new pavement markings.

F. Prior to application, the contractor shall field check and locate all pavement markings to the satisfaction and approval of the Architect/Engineer, and the City of Suffolk, Civil Inspections Department if applicable.

G. Thermoplastic pavement markings or preformed polymer shall not be installed at anytime within a 48-hour period following a rainfall.

H. The color shall conform to the standard highway colors throughout the expected life of the film.

I. Marking materials shall be applied at the specified dimensions and at the rate to result in a marking thickness of 90 mils +/- 5 mils (not including glass bead top dressing).

J. The markings shall be provided in specified widths and shapes. The preformed words and symbols shall conform to the applicable shapes and sizes as outlined in the Manual on Uniform Traffic Control Devices for streets and highways, current edition or as modified.

3.12 WHEEL STOPS

A. Install wheel stops in bed of adhesive as recommended by manufacturer.

B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Curbs and gutters.
2. Walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with Virginia Department of Transportation VDOT Standards and Specifications, Latest Edition and the City of Suffolk, Department of Public Works, Public Facilities Manual.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. ACI Publications: Comply with ACI 301 unless otherwise indicated.

E. Preinstallation Conference: Conduct conference at Project site .

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Plain-Steel Wire: ASTM A 82/A 82M, galvanized.

E. Deformed-Steel Wire: ASTM A 496/A 496M.

F. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

G. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, gray portland cement *Type II*. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C or Class F.

2. Blended Hydraulic Cement: ASTM C 595, Type IP, portland-pozzolan cement.
3. Normal-Weight Aggregates: ASTM C 33, Class 4S , uniformly graded. Provide aggregates from a single source.

B. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/8 to 5/8 inch nominal.
2. Aggregate Source, Shape, and Color: .

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Color: As selected by Architect from manufacturer's full range .

2.4 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, non-load bearing , for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 PAVEMENT MARKINGS

A. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

1. Color: As indicated.

2.8 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete.
1. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:

1. Compressive Strength (28 Days): 3000 psi .
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches , plus or minus 1 inch.
4. Air Content: 5-1/2 percent plus or minus 1.5 percent .

B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

C. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. .

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete paving.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not

further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.

2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.

2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.11 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two galvanized steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding

B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earth Moving for Sitework" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's personnel assigned to the Work shall have certification in one of the following categories from the Professional Landcare Network:

    a. Certified Landscape Technician - Exterior, with installation specialty area(s), designated CLT-Exterior.
    b. Certified Turfgrass Professional, designated CTP.
    c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
5. Pesticide Applicator: State licensed, commercial.

B. Preinstallation Conference: Conduct conference at Project site .

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying

1.6 PROJECT CONDITIONS

A. Planting Restrictions: Plant during the following period. Coordinate planting period with initial maintenance periods to provide required maintenance from date of Substantial Completion .

1. Season 1: May 1 –September 15 (Bermuda)
2. Season 2: September 15 – May 1 (Overseed with Annual Ryegrass)

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.7 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 90 days from date of Substantial Completion .
   a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
2. Sodded Turf: 90 days from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

C. Grass Seed Mix: Proprietary seed mix as follows:

1. Products: Approved grass seed of a Bermuda grass shall be used. Bermuda variety of Vamont will be accepted. If seeding is preformed between September 15 and May 1, the contractor shall overseed with common annual ryegrass and at rate of 7 pounds per 1000 square feet. The contractor shall revisit the site after May 1 to ensure the permanent turf has been established. The contractor shall reseed areas that are unestablished as deemed necessary by landscape architect. The contractor shall fertilize with a weed and feed product at a rate of 3 pounds per 1000 square feet to control any weeds in the permanent turf if deemed necessary by landscape architect.

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Approved grass sod of a Bermuda grass shall be used. Bermuda variety of Vamont will be accepted. The sod shall be grown from approved seed of known origin or from plantings or approved grass seedlings or stolons. It is to be inspected and certified to assure overall high quality and freedom from noxious weeds as well as excessive amounts of other crop and weedy plants at the time of harvest. The sod shall be machine cut in big roll form at a uniform soil thickness of one (1) inch at the time of cutting. Measurement for thickness shall exclude top growth and thatch. At least five (5) days before harvesting, the turf shall be mowed uniformly at a height of 1-1/2 inches. If sod is laid between May 1 and September 15, no over seeding is required. If sod is laid between September 15 and May 1, sod shall be a mixture of Vamont Bermuda grass and Annual ryegrass, sod shall be over seeded with common Annual Ryegrass at the rate of 7 pounds per 1000 square feet. The contractor shall visit the site after May 1 to ensure the permanent turf has been established. The contractor shall replace any unestablished areas as deemed necessary by the landscape architect. The contractor shall fertilize with a weed and feed product to control any weeds in the permanent turf as deemed necessary by the landscape architect.

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 TOPSOIL

A. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Provide a minimum of 4 inches of topsoil, or manufactured topsoil from off-site sources, in all turf and grass areas. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Classified loam material with not less than 2.5 percent organic material and with a PH between 5.6 and 6.5. Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete

slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.6 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

3.5 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.6 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf for no more than 1 year with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches .

2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Channel drainage systems.
3. Encasement for piping.
4. Manholes.
5. Cleanouts.
6. Nonpressure transition couplings.
7. Expansion joints.
8. Catch Basins.
9. Stormwater inlets.
10. Pipe Outlets.

B. Comply with The City of Suffolk, Department of Public Works, Public Facilities Manual, Latest Edition, and the VDOT Standards and Specifications, Latest Edition.

1.3 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soil tight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soil tight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.3 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals.

2.4 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443, rubber gaskets
2. Class II, Wall B.
3. Class V, Wall C.

2.5 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dallas Specialty & Mfg. Co.
   b. Fernco Inc.
   c. Logan Clay Pipe.
   d. Mission Rubber Company; a division of MCP Industries, Inc.
   e. NDS Inc.
   f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Cascade Waterworks Mfg.
   b. Dallas Specialty & Mfg. Co.
   c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fernco Inc.
   b. Logan Clay Pipe.
   c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.6 EXPANSION JOINTS

A. Ductile-Iron Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

2.7 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.8 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch] minimum thickness.

C. Form: Sheet or tube.

D. Color: Black.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

2.10 MANHOLES

A. Manholes shall be in accordance with The City of Suffolk, Department of Public Works, Public Facilities Manual, Latest Edition, and/or the VDOT Standards and Specifications, Latest Edition.

2.11 CATCH BASINS

A. Catch Basins and Drop Inlets shall be in accordance with The City of Suffolk, Department of Public Works, Public Facilities Manual, Latest Edition, and/or the VDOT Standards and Specifications, Latest Edition.

2.12 STORMWATER INLETS

A. Structures shall be in accordance with The City of Suffolk, Department of Public Works, Public Facilities Manual, Latest Edition, and/or the VDOT Standards and Specifications, Latest Edition.

2.13 PIPE OUTLETS

A. Flared End Section: shall be in accordance with The City of Suffolk, Department of Public Works, Public Facilities Manual, Latest Edition, and/or the VDOT Standards and Specifications, Latest Edition.

B. Riprap shall be placed where indicated on the plans. The minimum thickness of rip rap layer shall be two times the maximum stone diameter, but not less than 6 inches. Rip rap shall be Virginia Department of Transportation Class I with the following design valves:

D_{15} Weight (lbs)	Mean D_{15} Spherical Diameter (ft)	Mean D_{50} Spherical Diameter (ft)
50	0.8	1.1

Weight Range	Requirements for Stone Mixture
50 – 50 lbs	60% > 100 lbs

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving for Sitework."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

E. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.7 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving for Sitework." Arrange for installation of detectable trace wire directly over piping and at outside edge of underground structures.

1. Use detectable trace wire over ferrous piping.
2. Use detectable trace wire over nonferrous piping and over edges of underground structures.

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

   a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
   b. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

GENERAL

1. METHOD "A" PIPE BEDDING SHALL BE USED FOR ALL TYPES OF PIPE CULVERTS WITHIN THE APPLICABLE HEIGHT OF COVER RANGE NOTED IN THE STANDARD PC-1 TABLES UNLESS OTHERWISE NOTED ON THE PLANS.
2. H = HEIGHT OF COVER MEASURED FROM TOP OF CULVERT TO FINISHED GRADE.
3. b = EXCAVATION DEPTH AS SHOWN ON PLANS OR TO FIRM BEARING SOIL.

CIRCULAR PIPE

1. D = OUTSIDE DIAMETER OF PIPE.
2. d = INSIDE DIAMETER OF PIPE.
3. X = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   X = 12" WHERE d IS LESS THAN 36".
   X = 18" WHERE d IS 36" AND GREATER.
4. WHERE DIRECTED BY THE ENGINEER, BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE (EXCEPT PLASTIC PIPE) 30" AND LESS IN DIAMETER WITH HEIGHT OF COVER 15' OR LESS.
5. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE (EXCEPT PLASTIC PIPE) 30" AND LESS IN DIAMETER WITH HEIGHT OF COVER 15' OR LESS.
6. BEDDING MATERIAL AND CLASS I BACKFILL MATERIAL MAY BE ELIMINATED FOR SHOULDER SLOT INLET (DI-13) OUTLET PIPES INSTALLATIONS.

ELLIPTICAL PIPE

1. S_1 = OUTSIDE SPAN DIMENSION OF PIPE.
2. S_2 = INSIDE SPAN DIMENSION OF PIPE.
3. R = OUTSIDE RISE DIMENSION OF PIPE.
4. X = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   X = 12" WHERE S_2 IS LESS THAN 36".
   X = 18" WHERE S_2 IS 36" AND GREATER
5. WHERE DIRECTED BY THE ENGINEER, BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE WHERE S_2 IS 38" OR LESS AND HEIGHT OF COVER 15' OR LESS.
6. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE WHERE S_2 IS 38" OR LESS AND HEIGHT OF COVER 15' OR LESS.

PIPE ARCH

1. S = SPAN DIMENSION OF PIPE.
2. R = RISE DIMENSION OF PIPE.
3. B = SEE PC-1 TABLE FOR APPLICABLE PIPE MATERIAL
4. x = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   x = 12" WHERE S_2 IS LESS THAN 36".
   x = 18" WHERE S_2 IS 36" AND GREATER
5. WHERE DIRECTED BY THE ENGINEER, BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE WHERE S_2 IS 35" OR LESS AND HEIGHT OF COVER 15' OR LESS.
6. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE WHERE S IS 35" OR LESS AND HEIGHT OF COVER 15' OR LESS.

SPECIFICATION REFERENCE	INSTALLATION OF PIPE CULVERTS & STORM SEWERS GENERAL NOTES
302 303	VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 1 OF 1
	107.00

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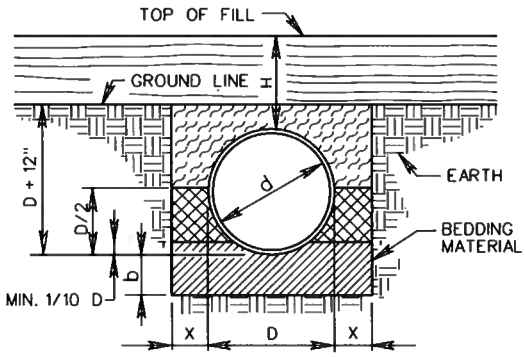
STORM SEWER IMPROVEMENTS
PIPE BEDDING NOTES
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

PB-1

NO PROJECTION OF PIPE ABOVE GROUND LINE



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

FOR PLASTIC PIPE CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS. ***NO. 57 STONE REQUIRED (UNO)**

FOR ALL OTHER PIPE REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

EMBANKMENT

REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

NOTES:

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

INSTALL. OF PIPE CULVERTS AND STORM SEWERS CIRC. PIPE BEDDING AND BACKFILL - METHOD "A"

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
302
303

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 4	REVISION DATE
107.01	07/12

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STORM SEWER IMPROVEMENTS

PIPE BEDDING DETAIL AND NOTES

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

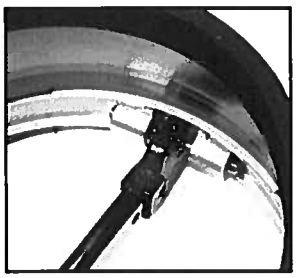
PROJECT NO.: **21156** DATE: **9/24/21**

PSX:DIRECT DRIVE

HIGH-PERFORMANCE PIPE-TO-MANHOLE CONNECTOR

What It Is

PSX: Direct Drive is a high-performance flexible pipe- to-manhole connector that offers easy installation and long-term performance in one convenient product. Whether you core or cast your holes, **PSX:Direct Drive** fits right into your production methods, ready to seal your toughest applications every time.



How It Works

PSX:Direct Drive has superior materials and technology

- Specially developed synthetic rubber is continuously tested and lab-certified
- Power Sleeve made from tempered Series 304 stainless steel
- Installation Mechanism made from Series 300 stainless steel
- Installation Mechanism is infinitely adjustable
- Installation tools are calibrated and certified
- Take-up clamps made from Series 304 stainless steel with quick-adjusting screws

Why It's Better

- Installs quickly and easily from outside the manhole
- Requires no retightening or adjustment
- All stainless-steel components
- No plastic parts to crack or break
- Accurately compensates for hole size variation
- Available for pipes from 1.7"- 44" OD
- Additional torque and multiple adjusters on larger diameters
- Use in manholes, wet wells, pump and lift stations, stormwater structures, on-site treatment structures, grease interceptors, or any application requiring a flexible watertight connector

How It Performs

PSX:Direct Drive *meets or exceeds all requirements of the following Specifications and/or Test Methods:*

ASTM C 923
ASTM C 1244
ASTM C 1478
ASTM F 2510

Protected by one or more of the following patents: 6805359, 7146689, 7263746

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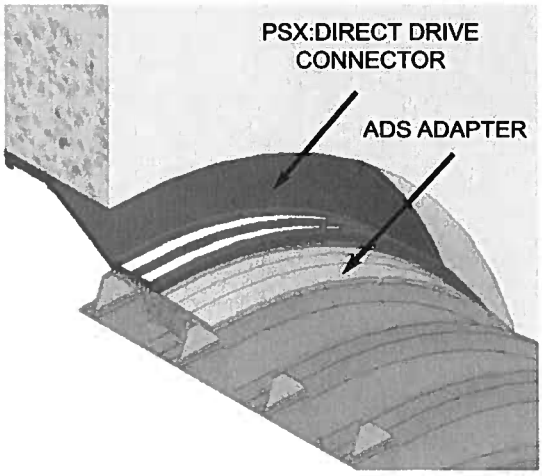
STORM SEWER IMPROVEMENTS
PIPE-TO-MANHOLE CONNECTOR
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21 3 of 43

ADS Pipe Adapter

Rubber Adapter for - ADS N-12 Drainage & - ADS N-12 HP Sanitary Corrugated Pipe

What It Is

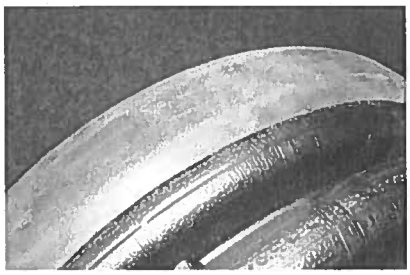
ADS Pipe Adapter is a rubber adapter ring which fits closely into the corrugation of the pipe, providing a smooth exterior diameter for connecting the pipe to manholes or other structures using PSX:Direct Drive or other flexible connector. **ADS Pipe Adapter** is required to make a watertight seal between boot-type connectors and corrrugated pipe to meet or exceed the requirements of ASTM F 2510 and ASTM D 2321 for either stormwater or sanitary applications.



How It Performs

ADS Pipe Adapter meets or exceeds all requirements of the following Specifications and/or Test Methods (Test data available upon request):

***ASTM F 2510** - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated High Density Polyethylene Drainage Pipes*
***ASTM C 1478** - Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals*
***ASTM D 2321** - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, Section 7.10 - Manhole Connections*



How It Works

ADS Pipe Adapter
has superior materials, technology, and design to meet or exceed the requirements of ASTM F 2510, ASTM C 1478, and ASTM D 2321

- ADS Pipe Adapter fits closely into the valley of the pipe corrugation.
- ADS Pipe Adapter area of the pipe is located under the clamp area of the connector.
- The connector clamp(s) is tightened, creating a flexible watertight seal between the pipe, adapter, connector, and structure.

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STORM SEWER IMPROVEMENTS

RUBBER ADAPTER FOR CORRUGATED PIPE (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21 4 of 43

ADS Pipe Adapter

SPECIFICATION and SELECTION GUIDE

For Rubber Adapter for
- ADS N-12 Drainage &
- ADS N-12 HP Sanitary
Corrugated Pipe

Submittal Specification

A rubber corrugated pipe adapter and flexible boot-type connector shall be employed in the connection of the ADS corrugated storm or sanitary sewer pipe to precast manholes or other structures. The adapter shall be ADS Pipe Adapter as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana, or approved equal. The flexible boot-type connector shall be PSX:Direct Drive as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana, or approved equal.

The adapter shall be the sole element relied on to assure a flexible, watertight seal of the pipe to the flexible connector and through the connector to the manhole or other structure. The adapter shall consist of a rubber gasket which fits closely into the corrugation of the pipe.

The rubber gasket element shall be constructed solely of synthetic or natural rubber, and shall meet or exceed the requirements of ASTM F 2510, ASTM C 1478, and ASTM D 2321, Section 7.10 - Manhole Connections.

Selection of the proper size adapter for the pipe requirement, and installation thereof, shall be in strict conformance with the recommendations of the adapter manufacturer.

The finished connection (pipe adapter and flexible boot-type connector) shall provide sealing to 10.8 psi (minimum) and shall accommodate angular deflection of the pipe to 7 degrees (minimum), and diametric deflection of 5% (minimum) with no loss of seal, as documented by test reports required by ASTM F 2510 and ASTM C 1478.

Testing of installed adapters and connectors shall be conducted in strict conformance with the requirements of the adapter and connector manufacturer.

HDPE PIPE TYPE and SIZE	ADS Pipe Adapter Part Number	ADAPTED PIPE OD. (INCHES)	PSX:DIRECT DRIVE CONNECTOR
ADS N-12 12" ADS N-12 HP 12"	545.1770.12	14.45	18Y PSX:DIRECT DRIVE
ADS N-12 15" ADS N-12 HP 15"	454.1794.15	17.57	22L PSX:DIRECT DRIVE
ADS N-12 18" ADS N-12 HP 18"	454.1776.18	21.20	24S PSX:DIRECT DRIVE
ADS N-12 24" ADS N-12 HP 24"	454.1804.24	27.80	32L PSX:DIRECT DRIVE
ADS N-12 30"	454.1802.30	34.86	40L PSX:DIRECT DRIVE

For watertight flexible connection of ADS Pipe Sizes greater than 30", a fitting or cylinder may be obatined from the pipe manufacturer.

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12"-60" HDPE WATERTIGHT MANHOLE CONNECTION USING A MANHOLE BOOT (CORED OR PRECAST) W/ CORRUGATED PIPE ADAPTER GASKET

PIPE SIZE	PIPE OD		ADS CORRUGATED PIPE ADAPTER GASKET	PRESS SEAL® SYSTEMS			KOR-N-SE
	A-PROFILE	H-PROFILE		PSX: DIRECT DRIVE **	CAST-A-SEAL	NPC ADAPTER ** A-PROFILE	NPC ADAPTER ** H-PROFILE	SERIES
12" (300mm)	14.5" (368.3mm)	N/A	125(	18Y	CAS 802	CGA-12A	N/A	S106-(
15" (375mm)	17.6" (447.0mm)	N/A	155(	22L	CAS 802	CGA-15A	N/A	S106-
18" (450mm)	21.2" (538.5mm)	N/A	185(	24S	CAS 802	CGA-18A	N/A	S206-24L
24" (600mm)	27.8" (706.1mm)	N/A	245(	32L	CAS 802	CGA-24A	N/A	S206-30L-32
30" (750mm)	35.1" (891.5mm)	N/A	305(	40L	CAS 802	CGA-30A*	N/A	S206-38L/S206-40
36" (900mm)	41.1" (1043.9mm)	41.1" (1043.9mm)	N/	N/A	CAS 802	CGA-36A*	CGA-36H	S206-44L
36" BNQ/CSA (900mm)	42.14" (1070.4mm)		N/	N/A	CAS 802	CGA-36A*		S206-46
42" (1050mm)	47.7" (1211.6mm)	48.0" (1219.2mm)	N/	N/A	CAS 802	CGA-42A*	CGA-42H	S206-52L
48" (1200mm)	53.6" (1361.4mm)	54.0" (1371.6mm)	N/	N/A	CAS 802	CGA-48A*	CGA-48H	S206-58L
54" (1350mm)	N/A	61.0" (1549.4mm)	N/	N/A	CAS 802	N/A	CGA-54H	S206-64L
60" (1500mm)	66.3" (1684.0mm)	67.0" (1701.8mm)	N/	N/A	CAS 802	CGA-60A*	OGA-60H	S206-70/S206-72

* NOT RATED FOR WATERTIGHT FIELD TESTING
** THIRD PARTY - CODES AS SUPPLIED BY MANUFACTURER
CAST-A-SEAL is a registered trademark of PRESS-SEAL GASKET CORP
PSX Systems are a product of PRESS-SEAL GASKET CORPORATION. (
KOR-N-SEAL is a registered trademark of NPC, Inc. (www.npc.com)

IN, (www.press-seal.com)
ss-seal.com)

IL BASED ON INFORMATION PROVIDED TO ADS. THIS
ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN
THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS
CIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL
SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VE NGINEERS RESPONSIBILITY TO ENSURE THE DETAILS

REV.	DESCRI
4	ADDED METRIC

12"-60" HDPE WATER-TIGHT GASKET AND CORR PIPE ADAPTER

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THI
DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUES

NOTES:

PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

SEE STANDARD DETAIL STD-201 AND TECHNICAL NOTE: 5.04 HDPE CONNECTIONS TO MANHOLES AND STRUCTURES FOR INSTALLATION RECOMMENDATIONS.

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON INFORMATION PROVIDED TO ADS. THIS DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUESTED. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL REVIEW THESE DETAILS PRIOR TO CONSTRUCTION. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN MEETS OR EXCEEDS THE APPLICABLE NATIONAL, STATE, OR LOCAL REQUIREMENTS AND TO ENSURE THAT THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

12"-60" HDPE MANHOLE PRECAST ADAPTER

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STORM SEWER IMPROVEMENTS

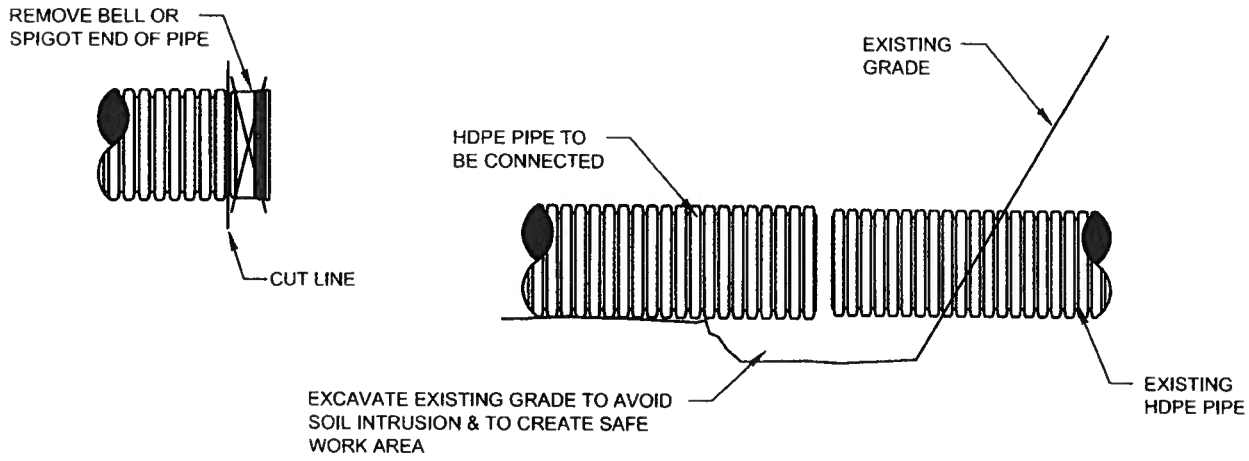
HDPE WATER-TIGHT GASKET DETAIL

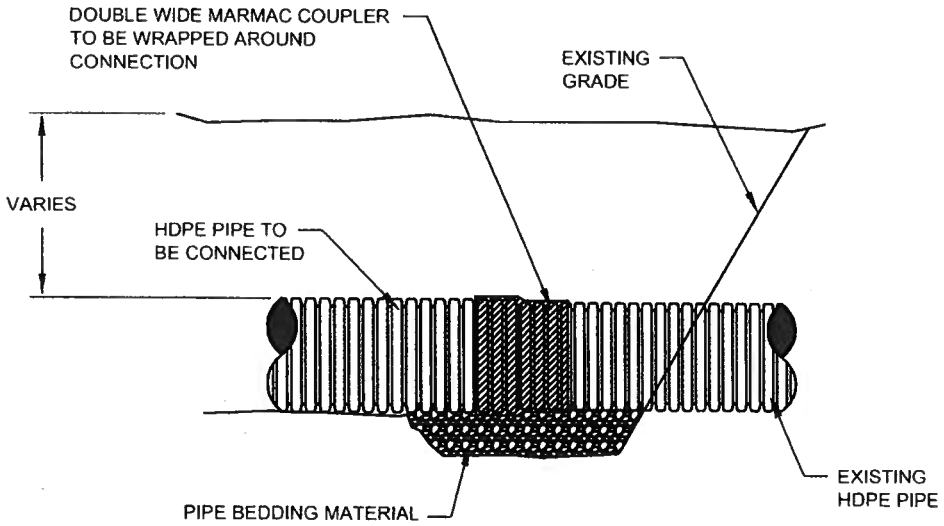
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

NOTES:

1. CONNECTION AND PIPE TO BE BACKFILLED PER ASTM D2321, LATEST EDITION.





REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D

HDPE TO HDPE CONNECTION DETAIL (MARMAC)

DRAWING NUMBER: STD-608

4640 TRUEMAN BLVD
HILLIARD, OHIO 43026
ADVANCED DRAINAGE SYSTEMS, INC.

DRAWN BY	RJS
DATE	1/20/15
CHK'D BY	
SCALE	NTS
SHEET	1 OF 1

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STORM SEWER IMPROVEMENTS

HDPE TO HDPE CONNECTION DETAIL

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

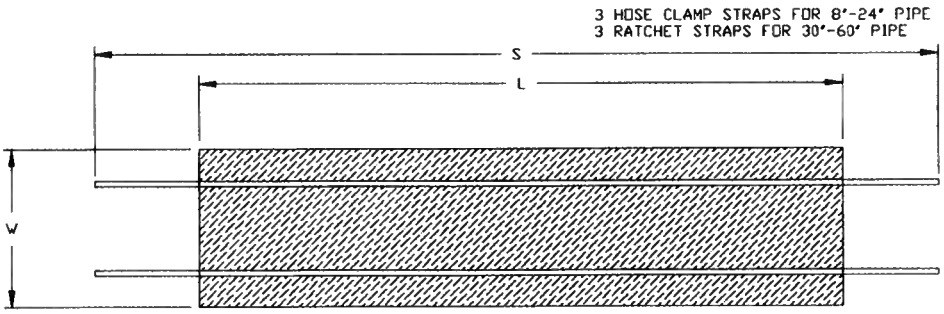
PROJECT NO.: 21156 DATE: 9/24/21

MAR MAC® POLYSEAL REPAIR COUPLER SPECIFICATION

Scope
The Mar Mac Polyseal Repair Coupler is a connection for 8- through 60-inch (200 to 1500 mm) ADS N-12 pipe.

Material Properties
The Mar Mac Coupler, as manufactured by Mar Mac® Construction Products, Inc. and distributed by ADS, Inc., consists of a mastic adhesive base layer, a cross-laminated polyethylene middle layer and a spun-bonded geotextile polypropylene cloth outer layer.

Installation
Installation shall be in accordance with Mar Mac Construction Products, Inc. recommended installation instructions. Polyseal repair coupler, in conjunction with corrugated HDPE pipe, is considered a soil-tight connection unless otherwise approved by local governing body.



		Standard		Double Wide	
Nominal Pipe Diameter, in. (mm)	Strap Length (S) in. (mm)	Length (L) in. (mm)	Width (W) in. (mm)	Length (L) in. (mm)	Width (W) in. (mm)
8 (200)	40 (1016)	35 (889)	4 (101)	n/a	n/a
10 (250)	40 (1016)	42 (1067)	6 (152)	n/a	n/a
12 (300)	50 (1270)	52 (1321)	7 (178)	52 (1321)	12 (305)
15 (375)	58 (1473)	62 (1575)	10 (254)	62 (1575)	14 (355)
18 (450)	71 (1803)	75 (1905)	10 (254)	75 (1905)	16 (406)
24 (600)	93 (2362)	94 (2387)	12 (305)	94 (2387)	20 (508)
30 (750)	125 (3175)	125 (3175)	15 (381)	125 (3175)	24 (609)
36 (900)	141 (3581)	141 (3581)	18 (457)	141 (3581)	30 (762)
42 (1050)	161 (4089)	161 (4089)	20 (508)	161 (4089)	30 (762)
48 (1200)	183 (4648)	183 (4648)	20 (508)	183 (4648)	32 (813)
60 (1500)	219 (5562)	222 (5639)	28 (711)	222 (5639)	46 (1168)

4", 6" and 54" standard couplers may be available by special order. Contact an ADS representative.

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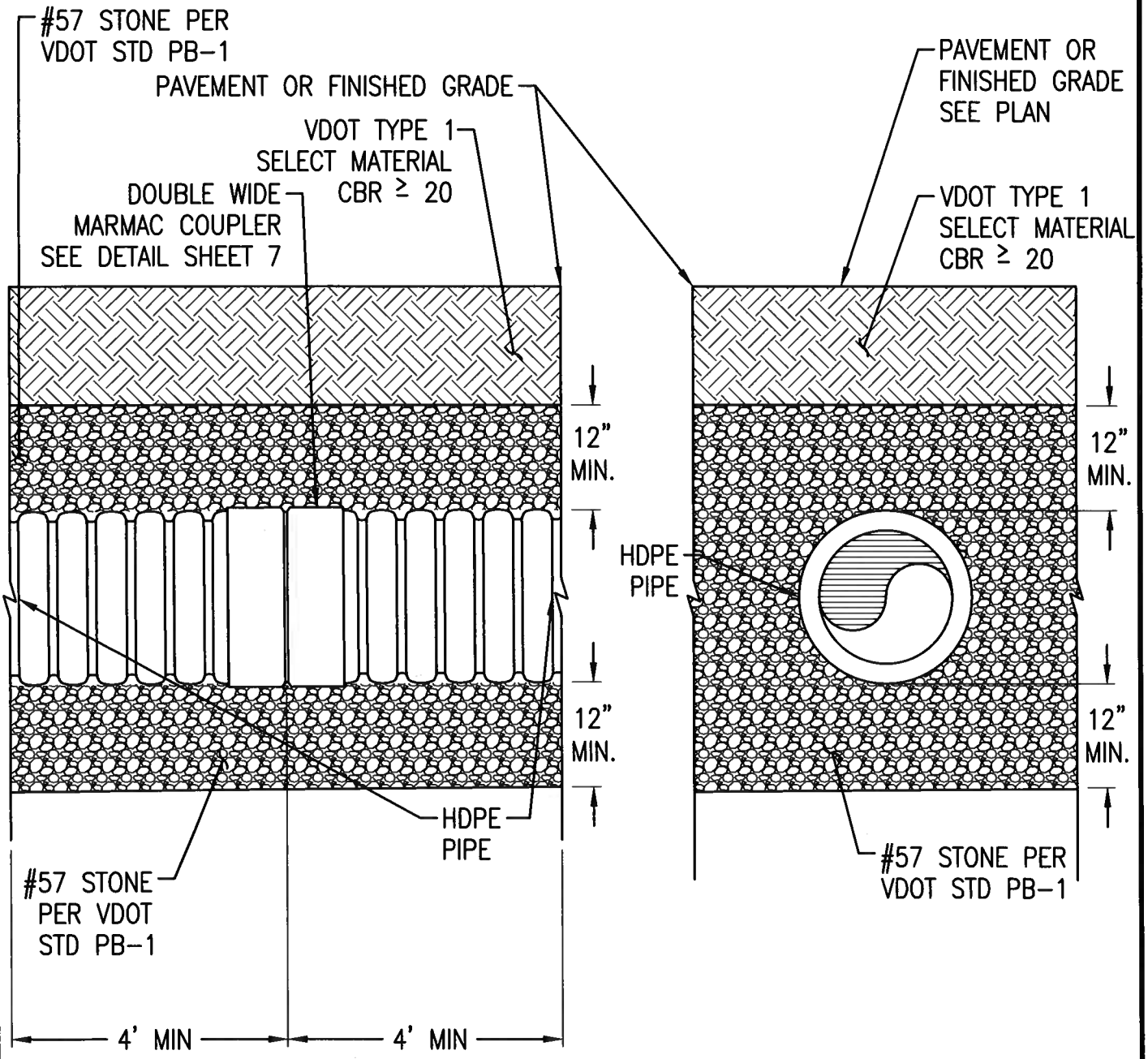

HDPE JOINT CONNECTION DETAIL

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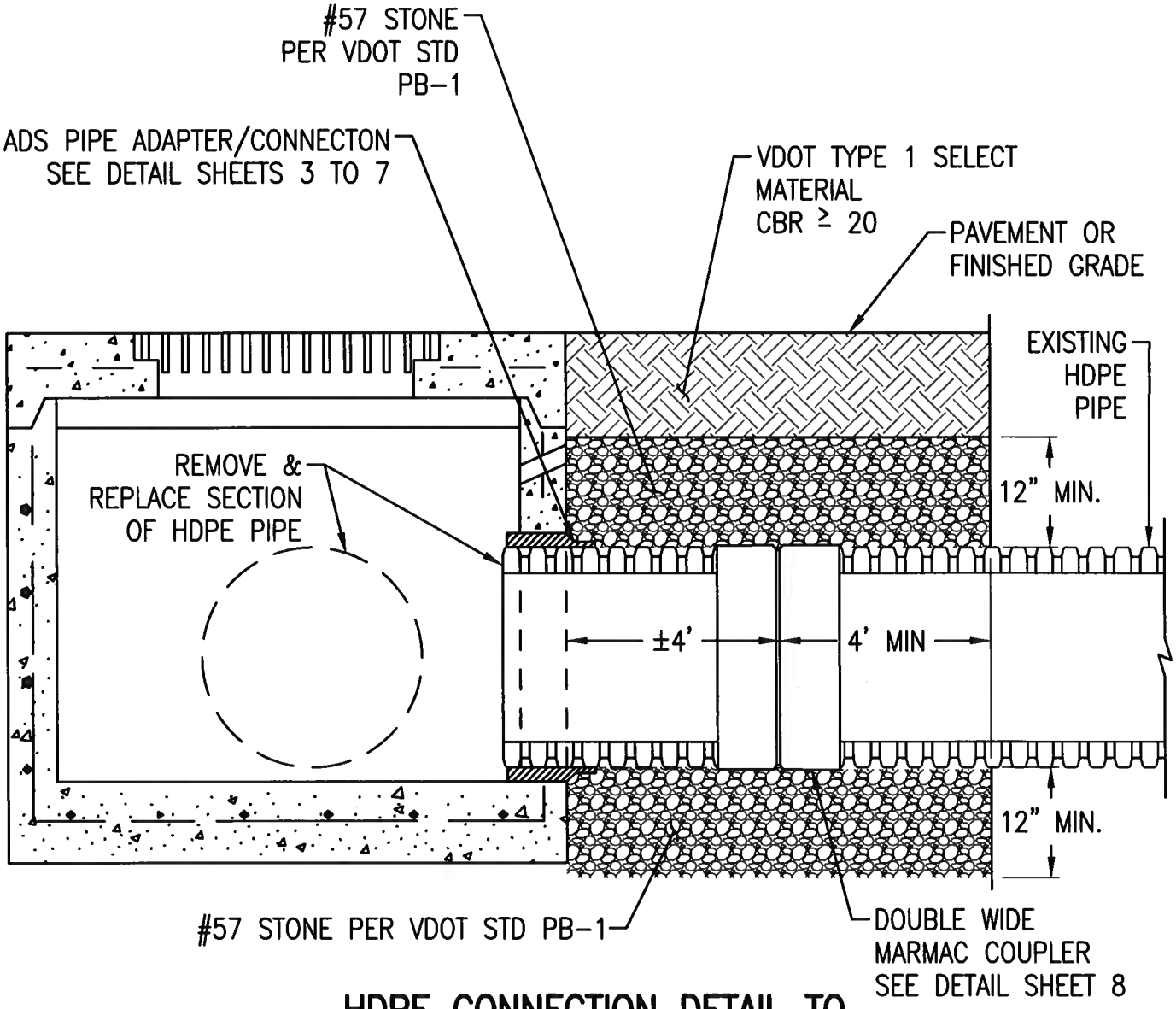
STORM SEWER IMPROVEMENTS

HDPE JOINT CONNECTION DETAIL

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



HDPE CONNECTION DETAIL TO EXISTING DROP INLET

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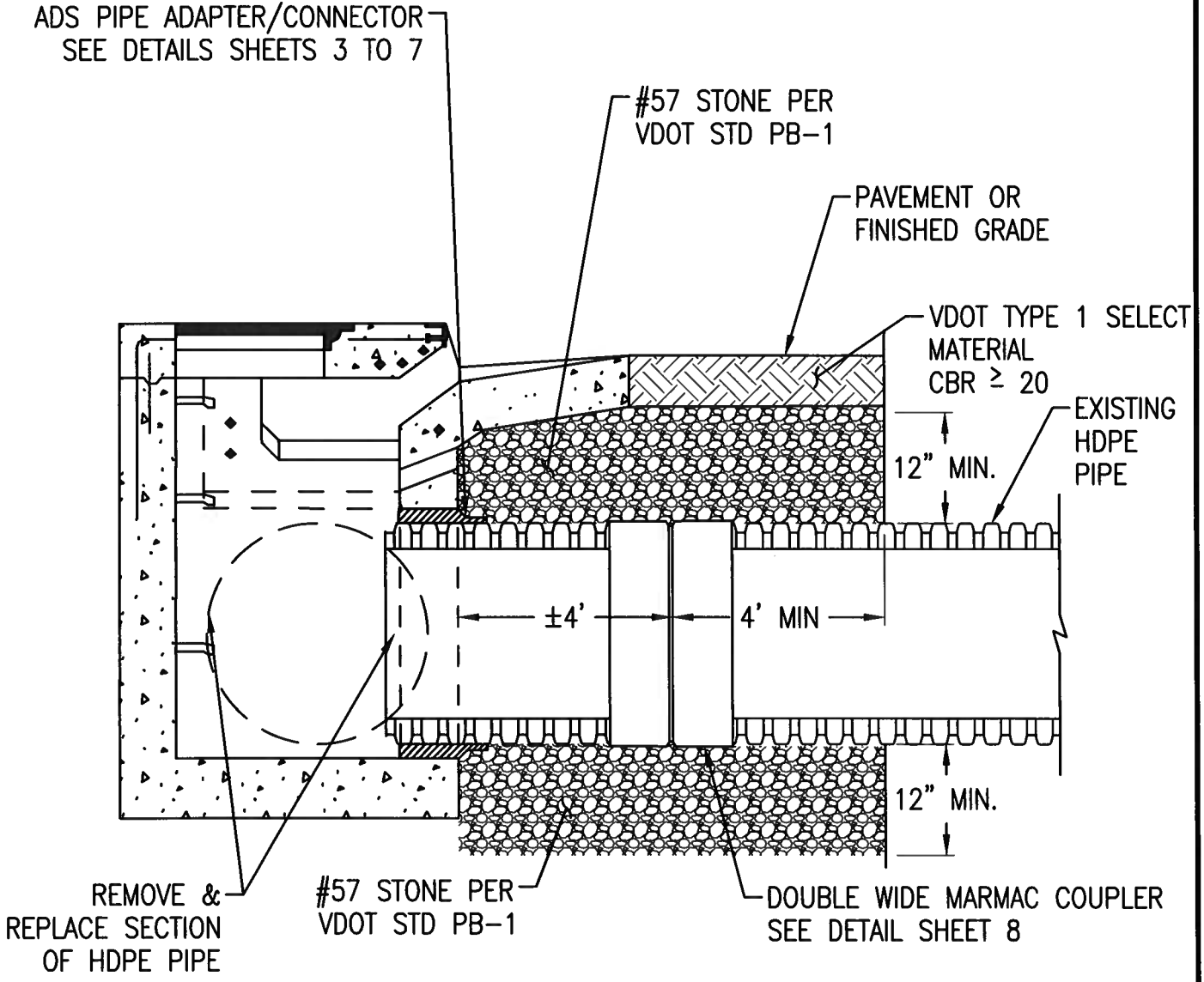
STORM SEWER IMPROVEMENTS

HDPE CONNECTION TO EXISTING DROP INLET

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



HDPE CONNECTION DETAIL TO EXISTING CURB INLET

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STORM SEWER IMPROVEMENTS

HDPE CONNECTION TO EXISTING CURB INLET

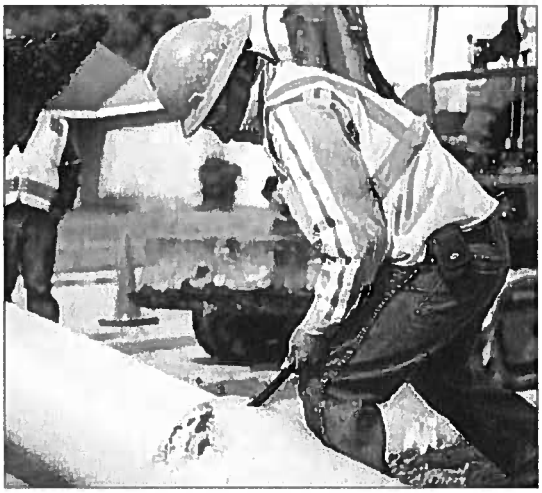
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: **21156** DATE: **9/24/21**

PVC: AMERICA'S PREFERRED MUNICIPAL PIPE

Our municipal waterworks and sewer infrastructure demands pipe systems that are proven to last. Our water and wastewater infrastructure is in critical condition and PVC pipe has become the clear economic choice for long-lasting functionality. Today, PVC pipe is specified more than twice as much as any other pipe material for its lifetime durability, corrosion resistance and ease of installation.

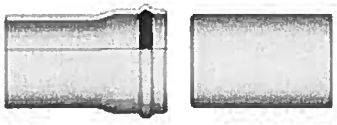
NAPCO's Municipal PVC Pipe Solutions are proven for potable water, gravity & force main sewers, and the growing use of water reclamation pipe as potable water becomes a precious commodity in the drought regions of our country. Repairs and new installations are simply easier and more cost effective with NAPCO's PVC pipe systems:



- Corrosive and chemical resistant, inside and out
- Segmented pipe for simple assembly in restrictive job site conditions
- Certa-Lok® restrained joint pipe systems are completely non-metallic
- More dimensionally stable than HDPE and faster to install & repair than fused joints
- Proven solutions for trenchless & open-cut applications
- Available with Certa-Lok Technology for restrained joint applications
- UV/Impact-resistant Yelomine® formulation available for bypass and temporary pipe systems
- Products are selectively listed, see product specification sheets for industry listings:

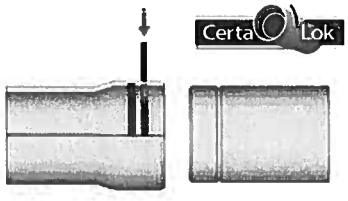
NSF Only products bearing the NSF Mark are Certified · UL · FM APPROVED · CSA

MAKE THE CONNECTION



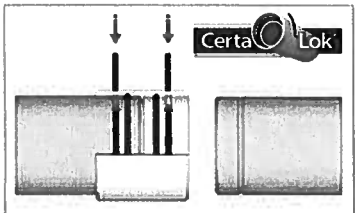
IB: (Bell & Spigot)

- Water, Sewer, & Reclaim
- Open cut installation
- CIOD: AWWA C900
- IPS: ASTM D2241
- PSM: ASTM D3034/F679
- Rieber Gasket/ASTM F477



RJIB: (Restrained Joint Integral Bell)

- Water, Sewer, & Reclaim
- Trenchless or open-cut installation
- CIOD: C900 Certa-Lok
- IPS: D2241 Certa-Lok
- Certa-Flo Gravity Sewer
- Yelomine – temporary bypass
- 6" through 16"
- Certa-Com electrical/communication
- O-ring or Profile Gasket/ASTM F477



RJ: (Restrained Joint Coupled)

- Water, Sewer, & Reclaim
- Trenchless or open-cut installation
- CIOD: C900 Certa-Lok
- IPS: D2241 Certa-Lok
- 2" through 24"
- O-ring or Profile Gasket/ASTM F477

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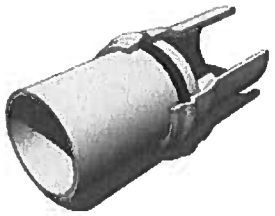
STORM SEWER IMPROVEMENTS
NAPCO PIPE - PVC JOINTS (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21 12 of 43

IB: INTEGRAL BELL

Our Integral Bell & Spigot design is excellent for open-cut applications where the affordability and durability of PVC are required.

Pressure Pipe	Pipe Sizes	DR	Pressure Class
CIOD: AWWA C900 Potable Water, Force Main & Reclaim	30", 36"	51	80 psi
	16" thru 36"	41	100 psi
	16" thru 36"	32.5	125 psi
	4" thru 36"	25	165 psi
	14" thru 36"	21	200 psi
	4" thru 30"	18	235 psi
	4" thru 16"	14	305 psi
IPS: ASTM D2241 Potable Water, Force Main & Reclaim	1.5" thru 12"	SDR 13.5 thru 41	100 thru 315 psi

Gravity Sewer	Pipe Sizes	SDR	Pipe Stiffness
PSM: ASTM D3034	4" thru 15"	SDR 35	46 psi
	4" thru 15"	SDR 26	115 psi
	4", 6"	SDR 23.5	153 psi
PSM: ASTM F679	18" thru 36"	PS 46	46 psi
	18" thru 36"	PS 115	115 psi



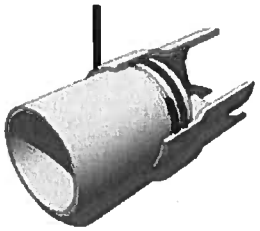
RJIB: RESTRAINED JOINT INTEGRAL BELL

Certa-Lok RJIB has a smooth profile perfect for horizontal directional drilling & static pipe bursting applications. Available in Certa-Lok D2241/RJIB with Yelomine for temporary bypass applications.

Pressure Pipe	Pipe Sizes	DR	Pressure Class
CIOD: C900/RJIB Certa-Lok Potable Water, Force Main & Reclaim	16"	25	165 psi
	6" thru 16"	18	235 psi
	6" thru 12"	14	305 psi
IPS: D2241/RJIB Certa-Lok with Yelomine Potable Water, Force Main, Reclaim, Aboveground & Temporary Bypass	4" thru 8"	21	200 psi
	4" thru 8"	17	250 psi
	Yelomine is a unique modified PVC compound designed to be sunlight & impact resistant for reliable above ground use. NSF approved for potable water use.		

Gravity Sewer	Pipe Sizes	DR	Pipe Stiffness
Certa-Flo IPS Gravity Sewer	10", 12"	26	115 psi
	4", 6", 8"	21	224 psi

Conduit	Pipe Sizes	Schedule	
Certa-Com	3", 4", 5", 6"	40	
	8"	80	
Certa-Com PVC pipe features Certa-Lok, the industry original non-metallic mechanically restrained joint system designed for use in electrical & communication conduit systems. Certa-Com PVC pipe is made in iron pipe size (IPS) outside diameters and meets all performance requirements of NEMA TC-2 and UL 651.			



Certa Lok

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STORM SEWER IMPROVEMENTS
NAPCO PIPE - PVC JOINTS (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

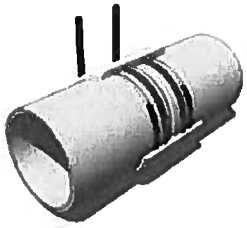
PROJECT NO.: **21156** DATE: **9/24/21**

RJ: RESTRAINED JOINT – COUPLED

Certa-Lok RJ offers design flexibility for trenchless or open-cut applications.
Available with Yelomine for temporary bypass applications.

Pressure Pipe	Pipe Sizes	DR	Pressure Class
CIOD: C900/RJ Certa-Lok Potable Water, Force Main & Reclaim	14" thru 24"	25	165 psi
	14" thru 24"	21	200 psi
	4" thru 24"	18	235 psi
	4" thru 12", 16"	14	305 psi
IPS: D2241/RJ Certa-Lok with Yelomine Potable Water, Force Main, Reclaim, Aboveground & Temporary Bypass	6" thru 12"	32.5	125 psi
	6" thru 12"	26	160 psi
	16"	26	90 psi
	4" thru 12", 16"	21	200 psi
	2" thru 8"	17	250 psi
	4" thru 8"	13.5	315 psi
	4" thru 8"	12.43	350 psi

Yelomine is a unique modified PVC compound designed to be sunlight & impact resistant for reliable above ground use. NSF approved for potable water use.



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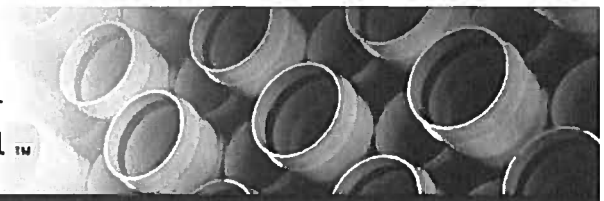
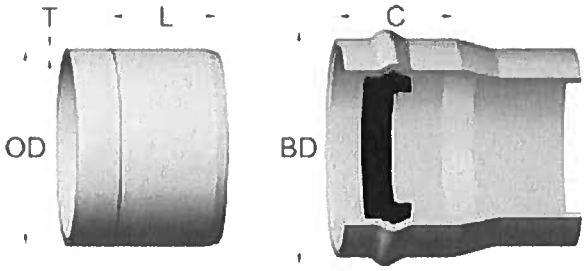
North American Pipe Corporation™



ASTM D3034: *Gasketed Integral Bell PVC Pipe*



NOMINAL PIPE SIZE	OUTSIDE DIAMETER (OD)	*APPROX. BELL DIAMETER (BD)	APPROX. BELL DEPTH (C)	INSERTION MARK (L)
4"	4.215	5.000	3.750	3.125
6"	6.275	7.375	4.625	4.000
8"	8.400	9.625	5.250	4.125
10"	10.500	12.250	5.875	5.125
12"	12.500	14.375	6.500	5.375
15"	15.300	17.500	7.750	7.375

NOMINAL PIPE SIZE	MINIMUM WALL THICKNESS (T)		
	PS 46 SDR 35	PS 115 SDR 26	PS 153 SDR 23.5
4"	.120	.162	**
6"	.180	.241	.265
8"	.240	.323	---
10"	.300	.404	---
12"	.360	.481	---
15"	.437	.588	---

Notes:

1. These dimensions are for estimating purposes only. All dimension are in inches.
2. SDR = Standard Dimension Ratio
3. PS = Pipe Stiffness (psi). This is a property that defines the pipe's ability to resist external loading.
4. * Dimension given for Approx. Bell Diameter (BD) is for highest pipe stiffness.
5. ** Consult our Customer Service or Sales Department for availability.

TDS-D3034-1 Rev: A00

Right, On Time, All the Time.

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STORM SEWER IMPROVEMENTS

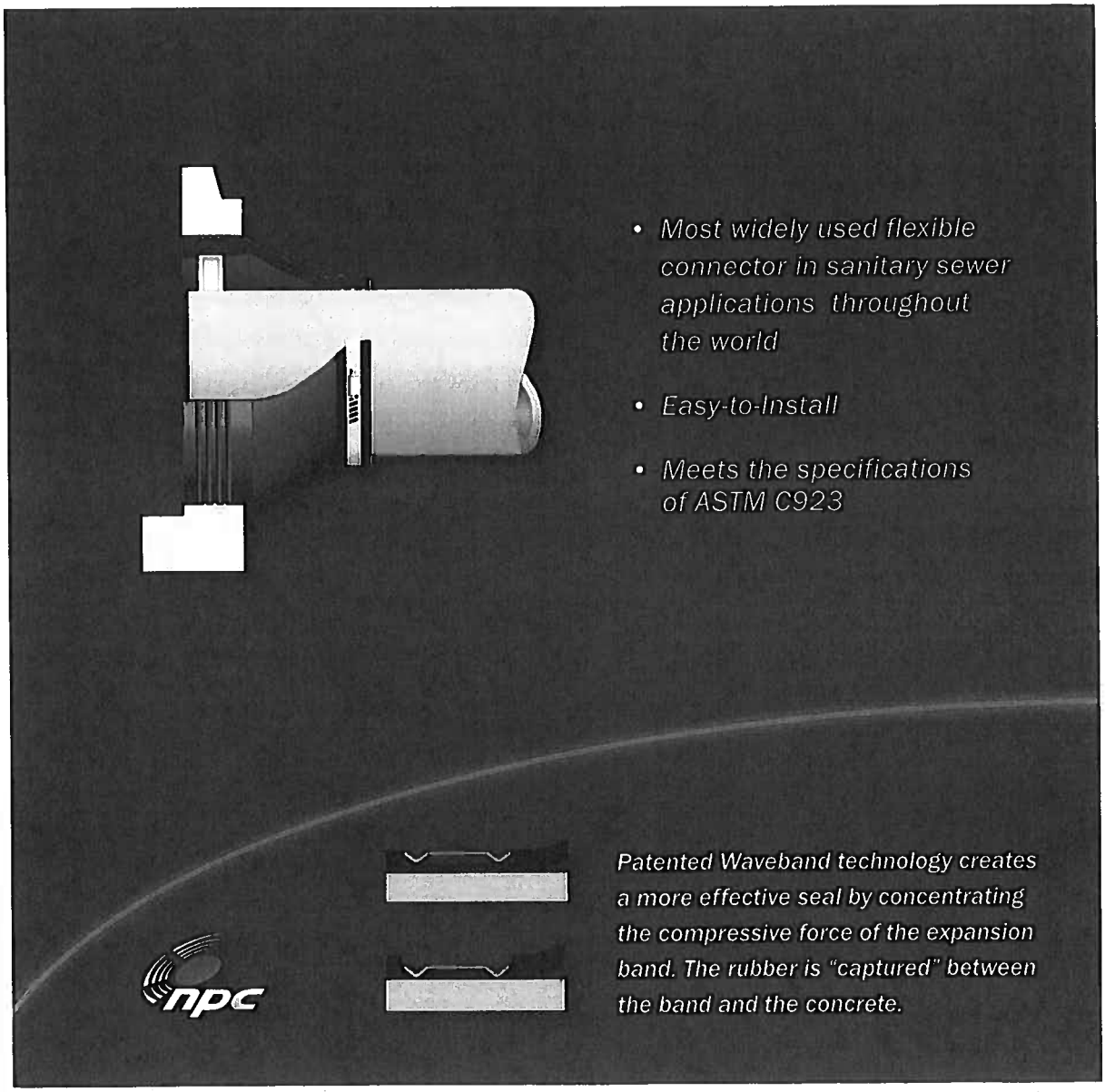
GASKETED INTEGRAL BELL PVC JOINT

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

TRELLEBORG

Kor-N-Seal® I
106/406 Series Pipe-to-Manhole Connector



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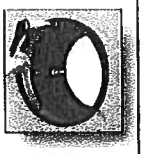
STORM SEWER IMPROVEMENTS
PVC PIPE TO MANHOLE CONNECTOR (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

Kor-N-Seal I
106/406 Series Pipe-to-Manhole Connector

Wedge Style Connectors
EX Series Plastic or Stainless Steel



Installation requires a ½" socket wrench & preset torque limiter.

PIPE O.D. RANGE	MODEL NUMBER	NOMINAL HOLE SIZE
1.50 - 4.80	S106-7MW	7"
3.50 - 4.50	S106-7W	7"
4.20 - 6.40	S106-8SRW	8"
1.50 - 4.80	S106-8MW	8"
5.10 - 5.90	S106-8W	8"
6.00 - 6.75	S406-10AW	10"
7.50 - 8.20	S406-10W	10"
6.00 - 6.75	S406-10.5AW	10½"
7.50 - 8.70	S406-10.5W	10½"
6.00 - 7.00	S406-11BW	11"
7.50 - 9.00	S406-11AW	11"
3.50 - 6.90	S106-12M	12"
6.00 - 7.00	S406-12CW	12"
6.25 - 7.50	S406-12BW	12"
7.50 - 9.00	S406-12AW	12"
9.00 - 10.20	S406-12W	12"
5.75 - 7.00	S106-12BW	12"
7.00 - 8.50	S106-12AW	12"
8.25 - 9.75	S106-12W	12"
9.50 - 11.25	S106-14AW	14"
9.50 - 11.25	S106-16BW	16"
11.25 - 13.00	S106-16AW	16"
13.00 - 14.20	S106-16W	16"
14.00 - 15.50	S106-20BWS	20"
15.50 - 17.00	S106-20AWS	20"
17.00 - 18.15	S106-20WS	20"

Refer to Recommended Installation Instructions.

Toggle Style Connectors (Jack-In Style)

Installation requires a hydraulic jack assembly

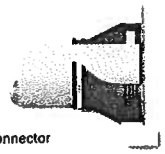
PIPE O.D. RANGE	MODEL NUMBER	NOMINAL HOLE SIZE
1.50 - 4.80	S106-7MT	7"
3.50 - 4.50	S106-7T	7"
4.20 - 6.40	S106-8SRT	8"
1.50 - 4.80	S106-8MT	8"
5.10 - 5.90	S106-8T	8"
6.00 - 6.75	S406-10AT	10"
7.50 - 8.40	S406-10T	10"
6.00 - 6.75	S406-10.5AT	10½"
7.50 - 8.90	S406-10.5T	10½"
6.00 - 7.00	S406-11BT	11"
7.50 - 9.00	S406-11AT	11"
3.50 - 6.90	S106-12MT	12"
6.00 - 7.00	S406-12CT	12"
6.25 - 7.50	S406-12BT	12"
7.50 - 9.00	S406-12AT	12"
9.00 - 10.50	S406-12T	12"
5.75 - 7.00	S106-12BT	12"
7.00 - 8.50	S106-12AT	12"
8.25 - 9.75	S106-12T	12"
9.50 - 11.25	S106-14AT	14"
9.50 - 11.25	S106-16BT	16"
11.25 - 13.00	S106-16AT	16"
13.00 - 14.50	S106-16T	16"

Refer to Recommended Installation Instructions.

To Install 7" & 8" Toggle Style Connectors:

Expander Assembly (p/n 90225)
8" Extension (p/n 13808)

Ordering Information



Kor-N-Seal I:
106/406 Series
Pipe-to-Manhole Connector

The 106 Series connector is 8 inches long, the 406 Series connector is 6 inches long. The number following the hyphen in our model numbers is the required hole size. The S106-20 Series is available in Stainless Steel Wedge only.

Recommended Torque Values:

Connectors with 8" hole size and smaller:

Steel Wedge - 1/2" Socket Wrench - 8 ft. lbs.

Connectors with 10 - 20" hole sizes:

EX Series - 1/2" Socket Wrench – 12 - 20 ft. lbs.
Steel Wedge - 1/2" Socket Wrench - 12 ft. lbs.

Preset torque limiters are available. Contact Customer Service at 1-800-626-2180 for more information.

For larger pipe sizes refer to Kor-N-Seal II Series Connectors

206 Series - For pipe sizes 15" - 51" in diameter.

306 Series - To fit larger pipe into smaller diameter manholes.

506 Series - Designed specifically for stormwater applications.

Using Corrugated Pipe

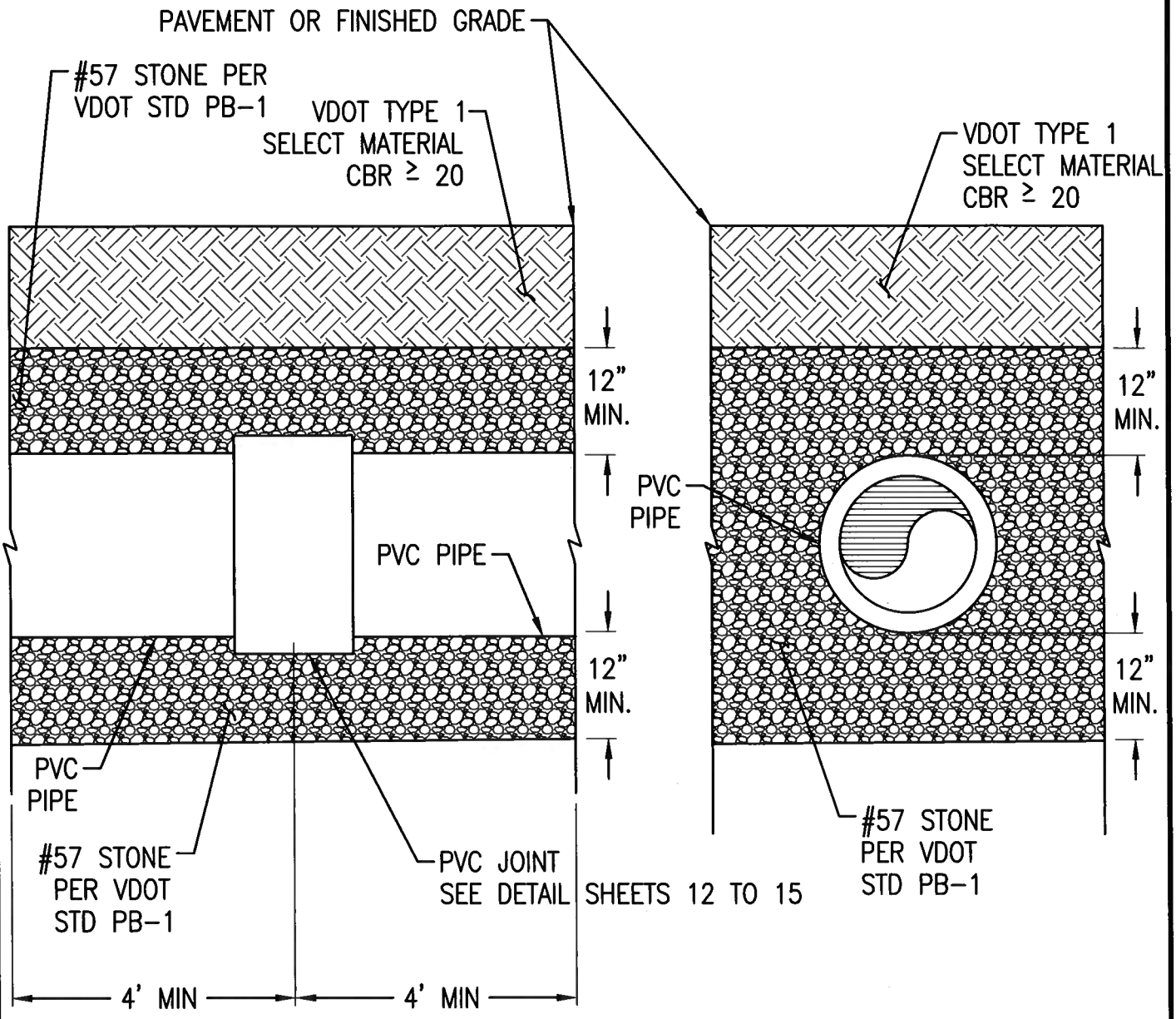
Adapters are required when using Corrugated Pipe. Refer to the Corrugated Pipe Adapter Data Sheet for details.

Covered under U.S. Patent No. 5,738,359

TRELLEBORG

Trelleborg Pipe Seals Milford, Inc.
P.O. Box 301, 250 Elm Street, Milford, New Hampshire 03055 U.S.A.
Tel: 800-626-2180 603-673-8680 Fax: 603-673-7271 www.trelleborg.com/npc

6/13



PVC JOINT CONNECTION DETAIL

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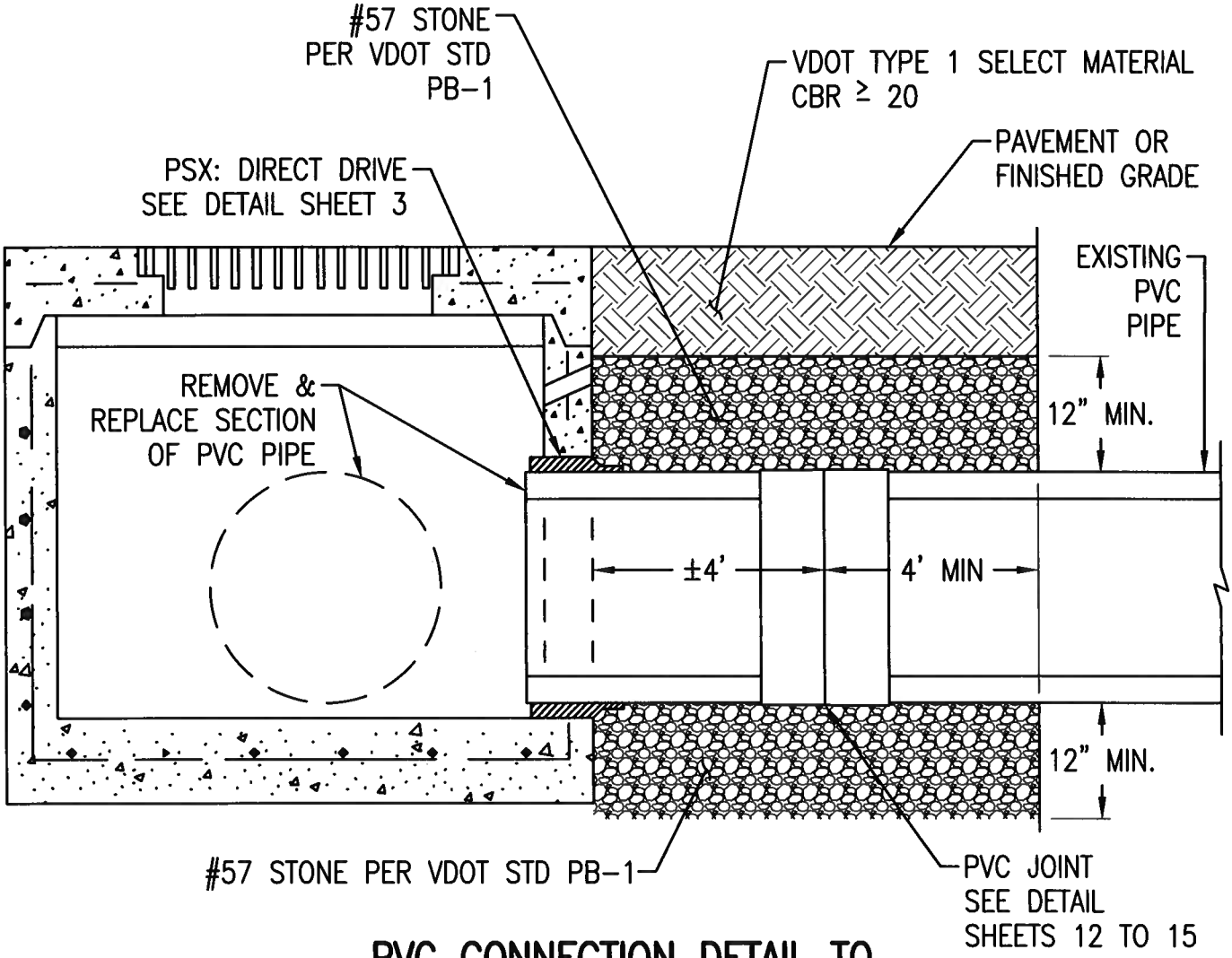
STORM SEWER IMPROVEMENTS

PVC JOINT CONNECTION DETAIL

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



PVC CONNECTION DETAIL TO EXISTING DROP INLET

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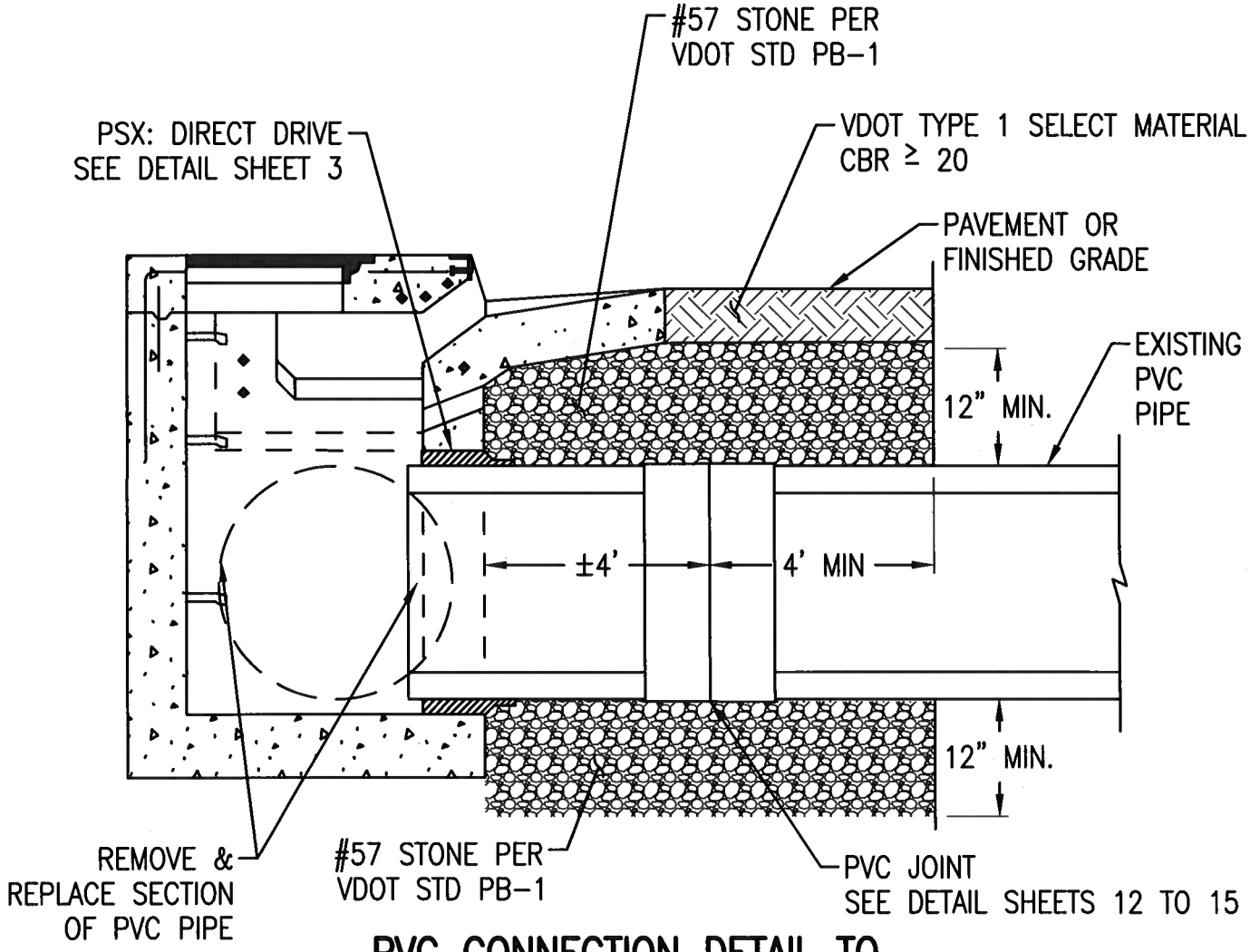
STORM SEWER IMPROVEMENTS

PVC CONNECTION TO EXISTING DROP INLET

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



PVC CONNECTION DETAIL TO EXISTING CURB INLET

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STORM SEWER IMPROVEMENTS

PVC CONNECTION TO EXISTING DROP INLET

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

PRODUCT SPECIFICATIONS

ConSeal CS102

Concrete Sealants INC.

Butyl Rubber Sealant For All Precast Structures; Meets Specs.

APPLICATIONS

For self-sealing joints in: Manholes, Concrete Vaults, Septic Tanks, Concrete Pipe, Box Culverts, Utility Vaults, Butial Vaults, and Vertical Panel Structures.

SEALING PROPERTIES

- Provides permanently flexible watertight joints.
- Low to high temperature workability: 30°F to 120°F (-1°C to 48°C)
- Rugged service temperature: -30°F to +200°F (-34°C to +93°C)
- Excellent chemical and mechanical adhesion to clean, dry surfaces.
- Sealed Joints will not shrink, harden or oxide upon aging.
- No priming normally necessary. When confronted with difficult installation conditions, such as wet concrete or temperatures below 40°F (4°C), priming the concrete will improve the bonding action. Constult Concrete Sealants for the proper primer to meet your application

HYDROSTATIC STRENGTH

ConSeal CS-102 meets the hydrostatic performance requirement as set forth in ASTM C-990 section 10.1 (Performance requirement: 10psi for 10 minutes in straight alignment - in plant, quality control test for jpint materials.)

SPECIFICATIONS

ConSeal CS-102 meets or exceeds the requirements of Federal Specification SS-S-210 (210-A), AASHTO M-198B, and ASTM C-990-91.

P.O. Box 176, New Carlisle OH, 45344 - 937.845.8776 or 800.332.7325
FAX 937-845-3587 - www.conseal.com

PRODUCT SPECIFICATIONS

ConSeal™ CS102

Concrete Sealants INC.

Butyl Rubber Sealant For All Precast Structures; Meets Specs.

PHYSICAL PROPERTIES

	Spec	Requited*	CS 102
Hydrocarbon blend content % by weight	ASTM D4 (mod.)	50% min.	51%
Inert mineral filler % by weight	AASHTO T111	30% min.	35%
Volatile Matter % by weight	ASTM D6	2% max.	1.2
Specific Gravity, 77°F	ASTM D71	1.15-1.50	1.25
Ductility, 77°F	ASTM D113	5.0 min.	10
Penetration, cone 77°F, 150 gm. 5 sec.	ASTM D217	50-100	55-60
Penetration, cone 32°F, 150 gm. 5 sec.	ASTM D217	40 mm	40-65
Flash Point, C.O.C., °F	ASTM D92	350°F min.	450°F
Fire point, C.O.C., °F	ASTM D92	375°F min.	475°F

APPLICATIONS

- 30-Day Immersion Testing: No visible deterioration when tested in 5% Caustic Potash, 5% Hydrochloric Acid, 5% Sulfuric Acid, and 5% saturated Hydrogen Sulfide. *
- One Year Immersion Testing: No visible deterioration when tested in 5% Formaldehyde, 5% Formic Acid, 5% Sulfuric Acid, 5% Hydrochloric Acid, 5% Sodium Hydroxide, 5% Hydrogen Sulfide and 5% Potassium Hydroxide.
- Requirements of ASTM C-990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

LIMITED WARRANTY

This information is presented in good faith, but we cannot anticipate all conditions under which this information and our products of the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety and suitability of our products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability and completeness of such information for this own particular use. We sell this product without warranty, and buyers and users assume all responsibility and liability for loss or damage arising from teh handling and use of this product, whether used alone or in combination with other products.

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General Practices & Procedures
Manhole

ConSeal
Concrete Sealants Inc.

To properly understand the best method of sealing the joint of a precast concrete product, some of the myths and misconceptions about sealants must be discussed. Laboratory testing and engineering analysis has lead to some "rules of thumb" when selecting and applying precast concrete joint sealants in a compression joint - in this case for fuel containment, compression joints.

DEFINITIONS

Compression Joint: A surface between two mating concrete sections where force is to be applied to compress the sealant material.

Preformed sealant: A composition of rubbers manufactured to meet a specific standard and formed into a shape for application in a compression joint.

Hydrostatic: Hydrostatic pressure is the pressure exerted by a fluid at equilibrium due to the force of gravity.

Annular Space: The intentional void space within a joint between the parallel angled surfaces.

Spigot: The part of the joint surface that extends out of the joint, the male end.

Bell: The part of the joint surface that is inside the joint, the female end.

Butyl: A hydrocarbon radical.

SEALANT SELECTION

Materials

Sealants are typically designed to resist hydrostatic forces at a pre cast concrete joint to provide a watertight seal. The American Society of Testing and Materials (ASTM) specification C990 defines the required composition and performance testing requirements for preformed butyl sealants. Sealants that meet this standard will provide a reasonable level of assurance for performance in watertight requirements. Butyl rubber content and hydrocarbon content are synonymous terms.

ASTM C443 specifies a performance requirement, which exceeds ASTM C990. Concrete Sealants manufactures precast concrete sealants meeting or exceed these performance requirements. The shape, size/volume, and placement are critical for the performance of a watertight pipe joint in hydrostatic conditions.

Shape

A traditional misconception of preformed sealants is that wider is better. This is a myth. Preformed butyl rubber sealants work best a higher rates of compression. As the sealant is compressed, the resistance force for further compression increases as a function of the percentage of compression. Time and temperature, as well as the sealant composition, will affect this rate. For instance, the force (psi) to compress the sealant the initial 10% to 50% may range from 2psi to 4psi. But as the sealant reaches 75% compression, the resistance force is about 8psi, and at 85% compression, this reaches a force of about 12psi. As the sealant is compressed, the dealing gasket increases in width as it becomes thinner. This width increases the surface area of the applied force. As the area reaches a point of equilibrium with the designed resistance force of the sealant, compression will stop. he analogy best used is the use of snow shoes. As the area of the applies force is increased, ther force per square inch is reduced; thus enabling a person to walk on top of the snow.

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STORM SEWER IMPROVEMENTS

BUTYL RUBBER SEALANT - MANHOLE CONNECTION (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

General Practices & Procedures
Manhole

ConSeal
Concrete Sealants Inc.

Size/Volume

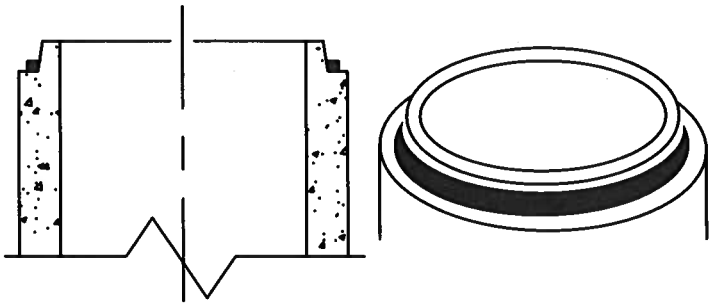
How sealant is needed to seal the joint? The answer is as varied as the types and sizes of concrete castings being produced. There is no magic answer. Too little sealant may cause the joint to leak; too much sealant will be difficult to compress. The size of sealant required is determined by the volume needed to fill enough of the void to eliminate the possibility that a hydrostatic force will "push" the sealant. A minimum gasket width in the joint of 2" is common.

Sealant manufacturers will specify the minimum amount of compression that is necessary to assure a watertight seal. The quick answer is a minimum of 50% compression. However, a gap that is too large will not provide an adequate seal, even if the sealant is compressed by 50% of its height. ConSeal recommends a maximum joint gap of 3/8". This recommendation is good to follow for all joints of precast components. The important thing to remember is that the tighter the joint is, the better the seal is, and the less chance there is a leak.

A rule of thumb for finding the width after compression is to use this formula: (TF/P)/100, where TF=Total force applied in pounds, P=the length of the entire perimeter in feet. Example: 15,000 pounds of forceis applied to a rectangular casting 10' x 5'. The perimeter is 30 feet. Calculate: (15,000/30)/100=5. Therefore, the sealant will compress to a nominal width of about 5".

Placement

Sealant placement is critical in providing the best, watertight joint. Best practice is to place sealant where the concrete touches tightest; it is also preferred to fill the annular space. On manholes, the best practice is to place the sealant at the base of the spigot end, around the collar of the joint. (See figure 1)



Adhesion

The adhesion of the sealant to the concrete affects the hydrostatic resistance. Water can pass by sealant through the concrete by absorption if the joint surface is not properly prepared. This will result in wetness in or near the joint, opposite of the side of the joint where water is present. Sealant will adhere to clean, dense, well-cured concrete surface. To improve adhesion, use one of ConSeal's primerts to create a surface to adhere the sealant.

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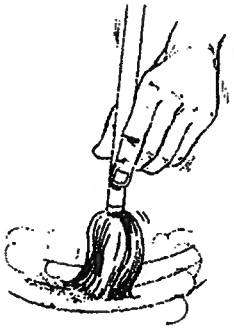
STORM SEWER IMPROVEMENTS

BUTYL RUBBER SEALANT - MANHOLE CONNECTION (2)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

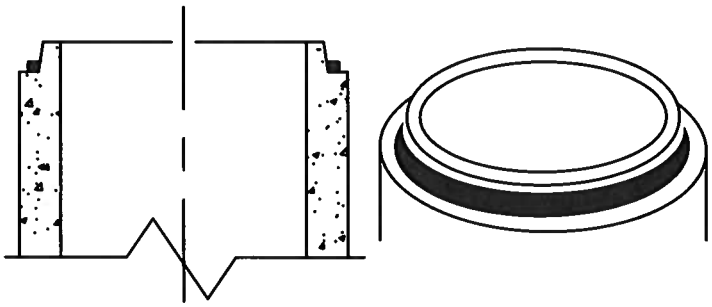
Installation Instructions

Manhole

ConSeal
Concrete Sealants Inc.



Clean the concrete joint surfaces by brushing off all loose concrete, dust, and dirt.



Apply ConSeal all around the outside of the spigot. Press into place.

The following procedures should be followed for optimum sealant performance.

- Clean the bell and spigot joint surfaces with a stiff bristle brush.
- Remove any dirt, debris, flashing, or concrete high points, which could keep the joint from coming together.
- If necessary, a joint primer (i.e. CS-50 or CS-75) can be applied to improve sealant adhesion.
- When using a primer, allow the primer to dry before placing sealant. The primer will normally be dry withing 15-20 minutes. CS-50 will be dull black, but not tacky. CS-75 will be orange and tacky.
  Note: CS-50 primer can be applied at the plant several days in advance of the set. CS-75 must be applied the day of installation.
- Place sealant on the tip of the spigot in the correct location (see image above).
- Join the sealant into one continuous strand by kneading the ends together ehere they meet. ***DO NOT STRETCH THE SEALANT. DO NOT OVERLAP THE SEALANT.***
- Once the sealant is installed, do not:
  - Step on the sealant
  - Allow dirt or debris to fall on the sealant
- Aminimum compression of 50% is required. Greater than 50% compression is optimal. This will vary according to the ambient temperature and the weight being applied.

Disclaimer: This publication is to assist users to understand the proper use of ConSeal's products. *Contact ConSeal's technical staff for installation instructions that meet your specific requirement.* Concrete Sealants, Inc. does not warranty any improper use of its products.

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STORM SEWER IMPROVEMENTS

BUTYL RUBBER SEALANT - MANHOLE CONNECTION (3)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

General Practices & Procedures
Reinforced Concrete Pipe

ConSeal
Concrete Sealants Inc.

To properly understand the best method of sealing the joint of a precast concrete product, some of the myths and misconceptions about sealants must be discussed. Laboratory testing and engineering analysis has lead to some "rules of thumb" when selecting and applying precast concrete joint sealants in a compression joint - in this case for fuel containment, compression joints.

DEFINITIONS

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Preformed sealant: A composition of rubbers manufactured to meet a specific standard and formed into a shape for application in a compression joint.

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SEALANT SELECTION

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Shape

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STORM SEWER IMPROVEMENTS
BUTYL RUBBER SEALANT - PIPE CONNECTION (1)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

General Practices & Procedures
Reinforced Concrete Pipe

ConSeal
Concrete Sealants Inc.

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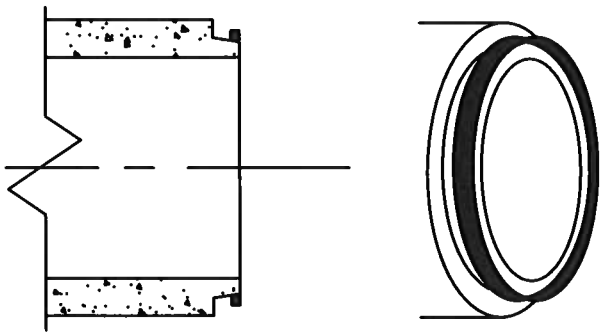
A rule of thumb for finding the width after compression is to use this formula: (TF/P)/100, where TF=Total force applied in pounds, P=the length of the entire perimeter in feet. Example: 15,000 pounds of forceis applied to a rectangular casting 10' x 5'. The perimeter is 30 feet. Calculate: (15,000/30)/100=5. Therefore, the sealant will compress to a nominal width of about 5".

Placement

Sealant placement is critical in providing the best, watertight joint. Best practice is to place sealant where the concrete touches tightest; it is also preferred to fill the annular space. On most reinforced concrete pipe sections, the best practice is to place the sealant on the outside of the spigot near the tip. (See figure 1)



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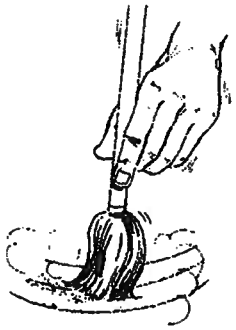
STORM SEWER IMPROVEMENTS
BUTYL RUBBER SEALANT - PIPE CONNECTION (2)
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

Installation Instructions

Reinforced Concrete Pipe

ConSeal
Concrete Sealants Inc.



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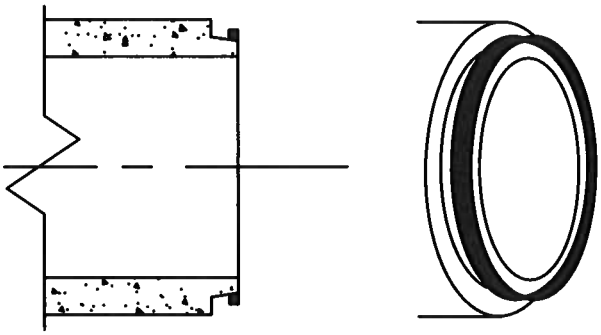

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STORM SEWER IMPROVEMENTS

BUTYL RUBBER SEALANT - PIPE CONNECTION (3)

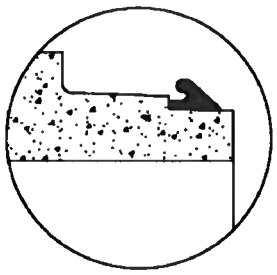
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

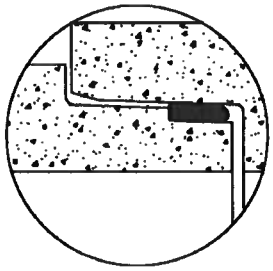
PROJECT NO.: **21156** DATE: **9/24/21**

TYPE 4G & 4F PROFILE

FOR SINGLE-STEP PIPE AND MANHOLE JOINTS

TYPE 4G & 4F Profile Gaskets were developed specifically to meet the needs of contemporary concrete pipe joint designs. Their unique design and superior quality provide the perfect match for reliable sealing of underground collection systems.





How They Work

- Wedge design reduces homing force while it concentrates sealing force
- Gasket slope creates an entrance angle that helps center the pipe during installation
- Unique "Swayback" design reduces pushback during pipe installation
- Increased rubber mass provides more gasket contact area between gasket and pipe
- Less likely to roll, pinch, or break bells
- Installation is simple and easy

Applications

- Sanitary Concrete Pipe Joints
- Stormwater Concrete Pipe Joints
- Manhole Joints
- Box Culvert Joints
- Elliptical Concrete Pipe Joints

Why They Are Better

- Rubber compounds were developed specifically for concrete pipe sealing
- Each profile design has been analyzed and optimized for a specific joint configuration
- Extrusion process is laser-controlled for precise, consistent sizing
- Every production run is tested and certified by our in-house Laboratory before being released for production
- Automated processing equipment eliminates variability in sizing
- 100% final inspection guarantees quality of the finished product

How They Perform

TYPE 4G & 4F PROFILES *meet or exceed all requirements of* ***ASTM C 443 and ASTM C 1619***

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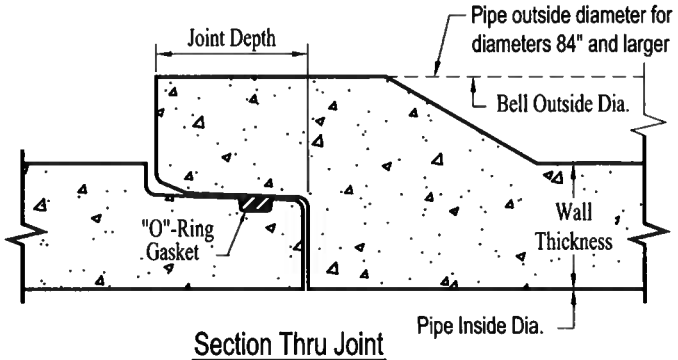
STORM SEWER IMPROVEMENTS
TYPE 4G & 4F PROFILE GASKETS
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

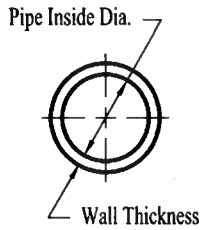
Rinker MATERIALS™

Concrete Pipe Division

Reinforced Concrete Pipe
O-Ring Joint
12" - 96" Diameter



Section Thru Joint



Section Thru Barrel

Table of Dimensions and Weights					
Pipe Inside Diameter (Inches)	Wall Thickness (Inches)	Joint Depth (Inches)	Bell Outside Diameter (Inches)	Length (Feet)	Weight (Lbs./Ft.)
12	2	4 5/8	23	6	120
15	2 1/4	4 5/8	26	6, 8	155
18	2 1/2	4 5/8	29	6, 8	175
21	2 3/4	4 5/8	32	6, 8	225
24	3	4 5/8	35	6, 8	290
27	3 1/4	4 5/8	38 3/4	6, 8	350
30	3 1/2	4 5/8	42 1/4	8, 12	410
33	3 3/4	4 3/4	46 3/4	8, 12	480
36	4	4 7/8	50 1/4	8, 12	563
39	4 1/4	5	54	8, 12	645
42	4 1/2	5 1/4	58	8, 12	745
48	5	5 1/2	64	8, 12	920
54	5 1/2	5 1/2	70	8, 12	1125
60	6	5 1/2	76	8, 12	1340
66	6 1/2	5 1/2	82	8, 12	1580
72	7	5 1/2	88	8, 12	1840
78	7 1/2	5 1/2	94	8, 12	2110
84	8	5 3/4	100	8, 12	2410
90	8 1/2	6 1/8	107	8, 12	2740
96	9	6 5/8	114	8, 12	3095

Pipe dimensions may vary depending upon equipment availability.

Notes:

1. Pipe manufactured to meet current ASTM specifications.
2. Pipe diameters larger than 96" are available.
3. Contact a Concrete Pipe Division representative for details not listed on this sheet.

Rinker 002

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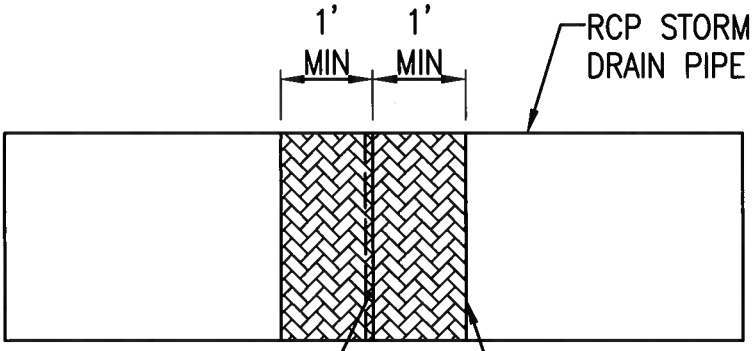

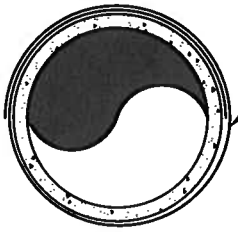

* FILTER FABRIC SHALL BE NONWOVEN GEOTEXTILE CONSTRUCTION FABRIC (AMOCO #4545 OR EQUAL)

JOINT WRAP FOR RCP STORM DRAIN PIPES

NTS

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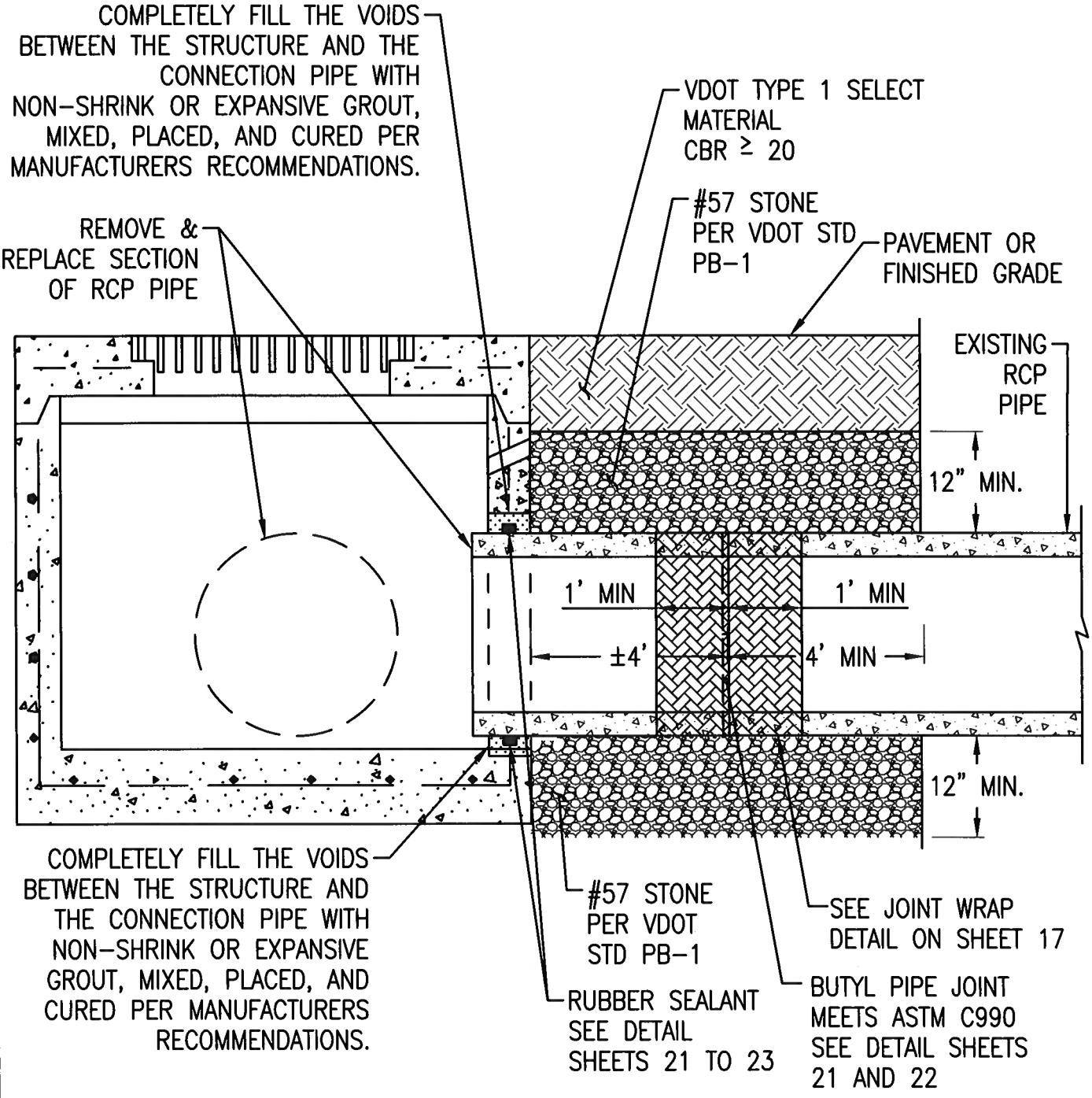
STORM SEWER IMPROVEMENTS

RCP JOINT CONNECTION DETAIL

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



RCP CONNECTION DETAIL TO EXISTING DROP INLET

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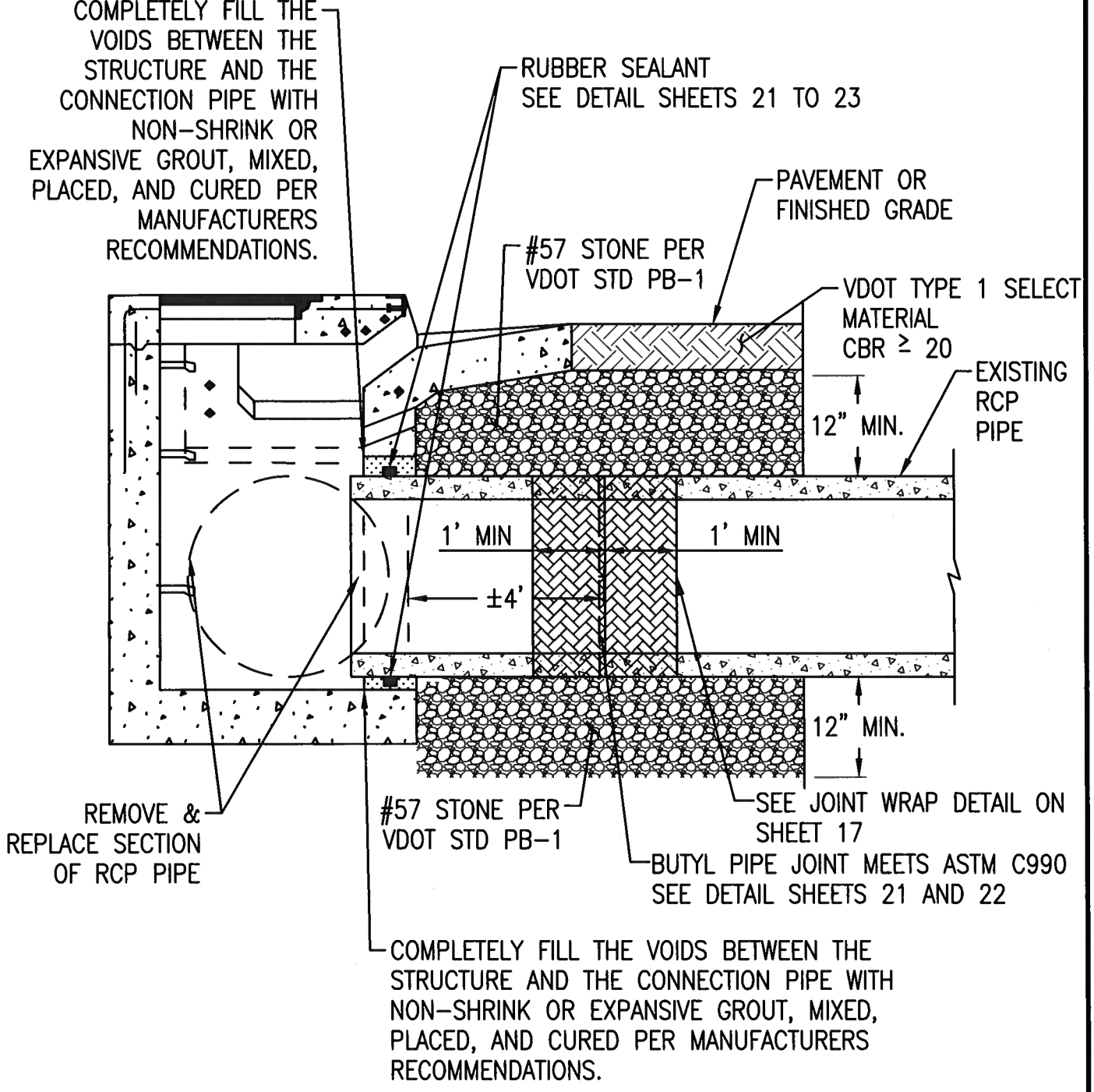
STORM SEWER IMPROVEMENTS

RCP CONNECTION TO EXISTING DROP INLET

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21



RCP CONNECTION DETAIL TO EXISTING CURB INLET

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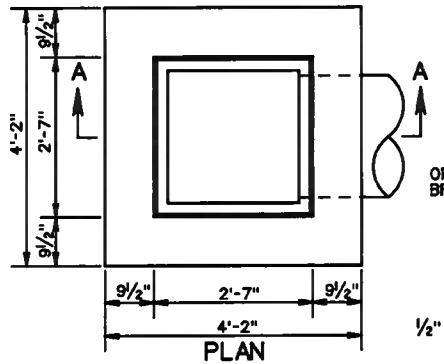
STORM SEWER IMPROVEMENTS

RCP CONNECTION TO EXISTING DROP INLET

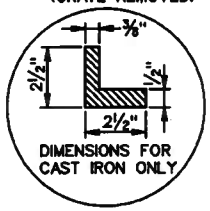
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

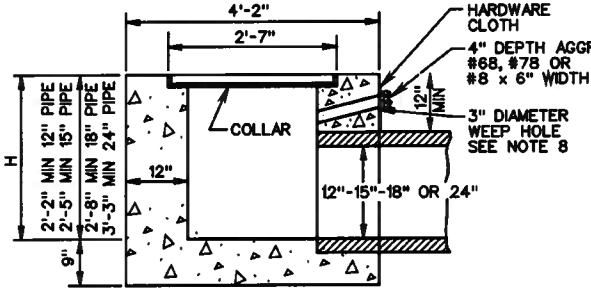
DI-1



PLAN
(GRATE REMOVED)



DETAIL A

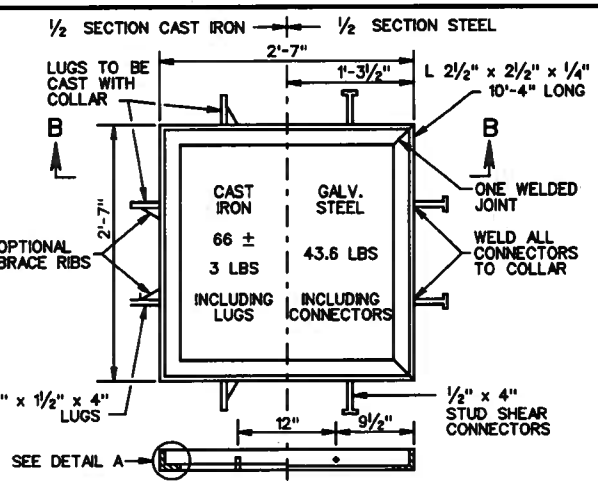


SECTION A-A

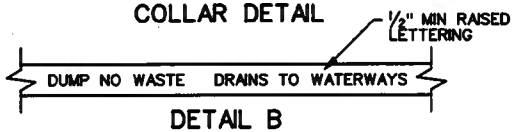
CONCRETE QUANTITIES FOR MIN. DEPTH

12" CONCRETE PIPE - 1.440 CU. YD. CONCRETE
15" CONCRETE PIPE - 1.528 CU. YD. CONCRETE
18" CONCRETE PIPE - 1.620 CU. YD. CONCRETE
24" CONCRETE PIPE - 1.817 CU. YD. CONCRETE

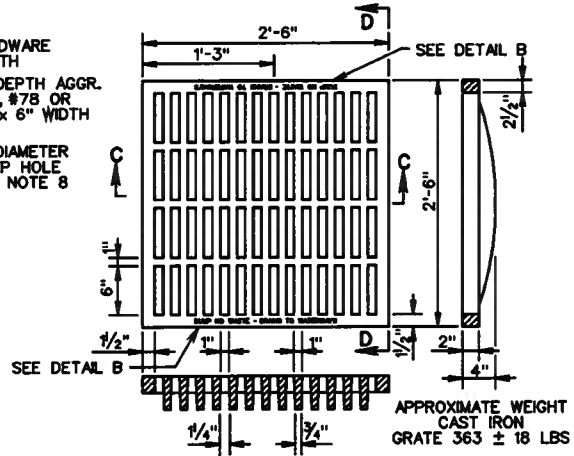
ADD 0.469 CU. YD. PER ADDITIONAL FOOT OF DEPTH.



SECTION B-B
COLLAR DETAIL



DETAIL B



APPROXIMATE WEIGHT CAST IRON GRATE 363 ± 18 LBS

SECTION C-C

SECTION D-D

GRATE DETAIL

NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 10' USE STANDARD DI-1A
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO INLET SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2"X4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH ¼" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. CAST IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
10. ANY ALTERNATE METHODS OF ANCHORAGE MEETING THE APPROVAL OF THE ENGINEER MAY BE SUBSTITUTED FOR THE CAST IRON LUGS AS SHOWN HEREON.
11. DUMP NO WASTE DRAINS TO WATERWAY LETTERING IS REQUIRED ON ALL DI-1 GRATES. LOCATION OF LETTERING MAY VARY BY MANUFACTURER.

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1	REVISION DATE
104.01	

STANDARD DROP INLET

12" - 24" PIPE: MAXIMUM DEPTH (H) = 10'

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
233 302

2016 ROAD & BRIDGE STANDARDS

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STORM SEWER IMPROVEMENTS
VDOT STD DI-1 - DROP INLET
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

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STORM SEWER IMPROVEMENTS

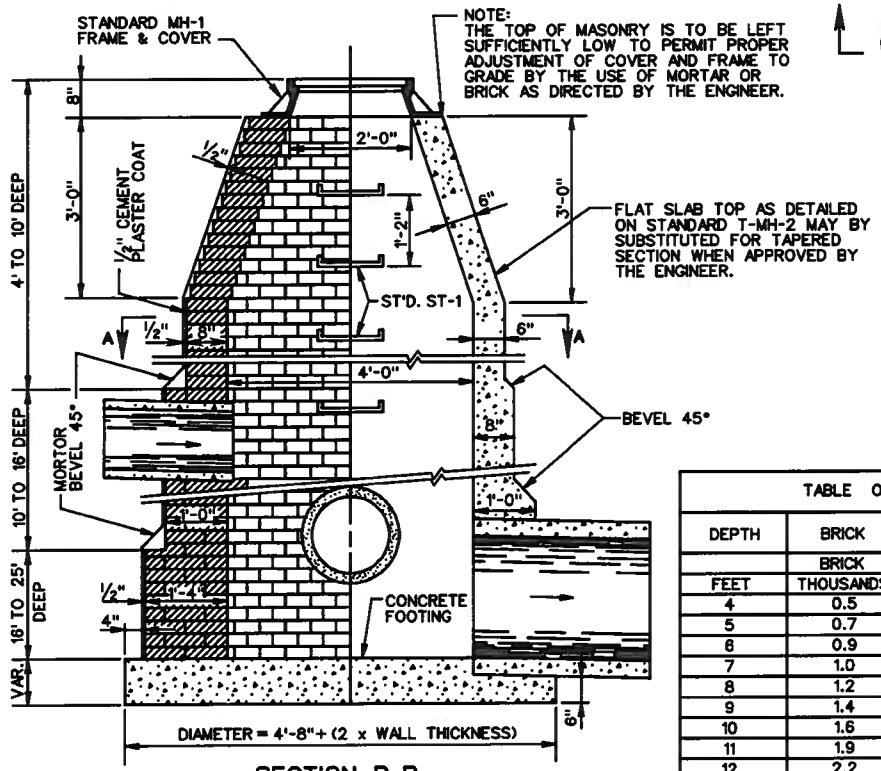
VDOT MH-1 (1) - MANHOLE [FOR REFERENCE]

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

MH-1

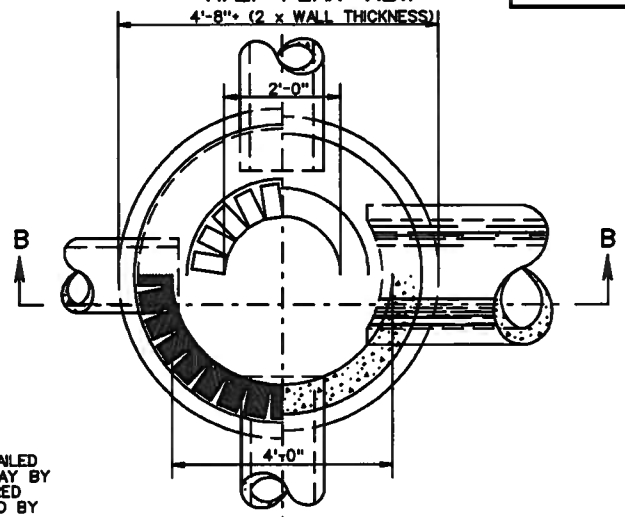
SEE STANDARAD SL-1 FOR APPLICABILITY OF SAFETY SLABS.



SECTION B-B

BRICK CONCRETE OR CONCRETE BLOCK

HALF PLAN VIEW



HALF SECTION A-A
(WITH FRAME AND COVER REMOVED)

BRICK CONCRETE

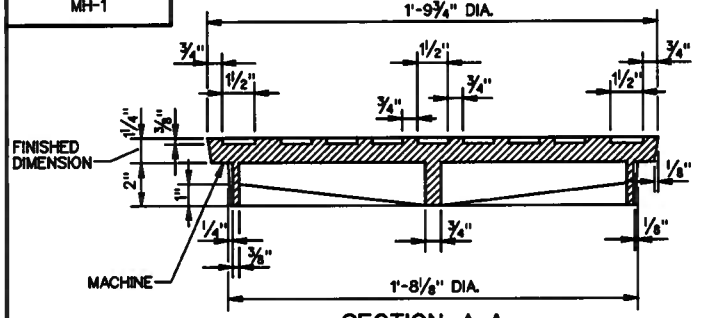
TABLE OF QUANTITIES			
DEPTH	BRICK MANHOLE		CONCRETE MANHOLE
	BRICK	CONCRETE	CONCRETE
FEET	THOUSANDS	CU. YARDS	CU. YARDS
4	0.5	0.785	1.437
5	0.7	0.785	1.699
6	0.9	0.785	1.961
7	1.0	0.785	2.223
8	1.2	0.785	2.485
9	1.4	0.785	2.747
10	1.6	0.785	3.009
11	1.9	0.970	3.455
12	2.2	0.970	3.817
13	2.5	0.970	4.179
14	2.8	0.970	4.541
15	3.1	0.970	4.903
16	3.4	0.970	5.265
17	4.0	1.173	6.032
INCREMENT	0.45	-	0.582

NOTES:

1. QUANTITIES SHOWN ARE FOR MANHOLE WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
2. A BASE THICKNESS OF 9" WAS USED IN COMPUTING CONCRETE QUANTITIES.
3. INCREMENTS TO BE ADDED FOR EACH ADDITIONAL FOOT OF DEPTH.
4. MATERIALS MAY BE BRICK, CONCRETE OR APPROVED CONCRETE MANHOLE BLOCK.
5. IF BLOCKS ARE USED THE MINIMUM THICKNESS OF SAME IS TO BE 5". OTHER THICKNESSES ARE TO CONFORM TO WALL THICKNESS SHOWN FOR CONCRETE.
6. ALL CONCRETE TO BE CLASS A3.
7. WHEN SPECIFIED ON PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

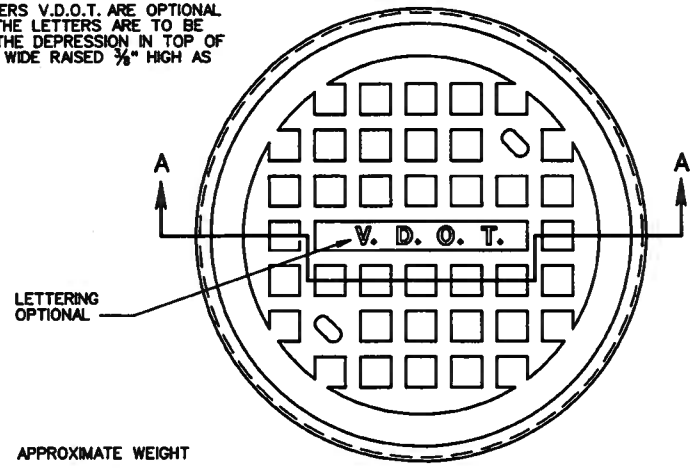
SPECIFICATION REFERENCE	MANHOLE FOR 12" - 48" PIPE CULVERTS	VDOT ROAD AND BRIDGE STANDARDS
302	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE: SHEET 1 OF 5; 106.01

MH-1



SECTION A-A

THE LETTERS V.D.O.T. ARE OPTIONAL. IF USED THE LETTERS ARE TO BE CAST IN THE DEPRESSION IN TOP OF COVER 1" WIDE RAISED ⅜" HIGH AS SHOWN.

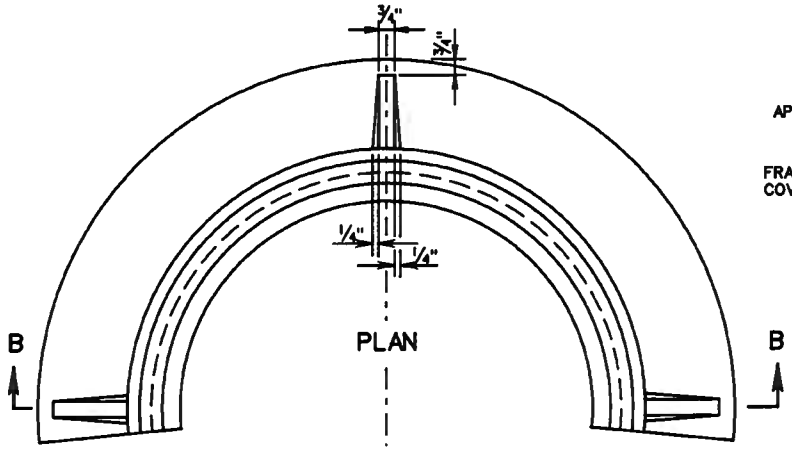


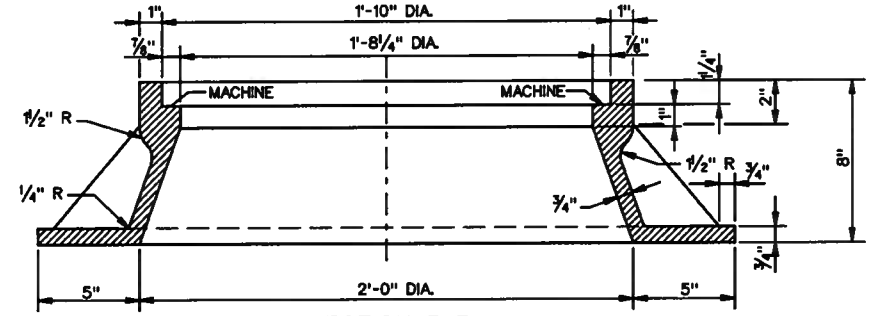
TOP

APPROXIMATE WEIGHT

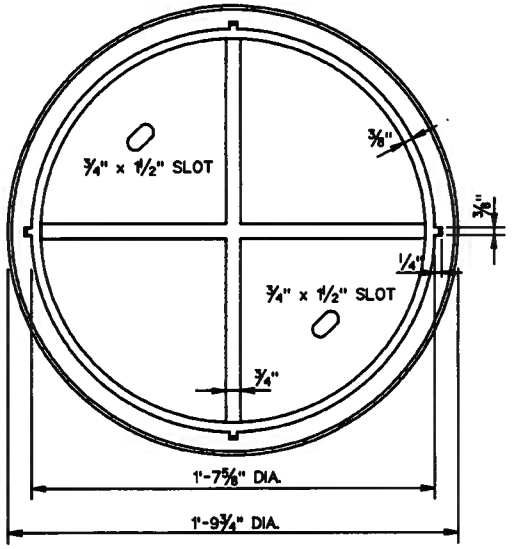
CAST IRON

FRAME 239 ± 12 LBS.
COVER 137 ± 7 LBS.





SECTION B-B



BOTTOM

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 2 OF 5 | REVISION DATE
106.02

STANDARD MANHOLE FRAME AND COVER

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
224
302

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STORM SEWER IMPROVEMENTS

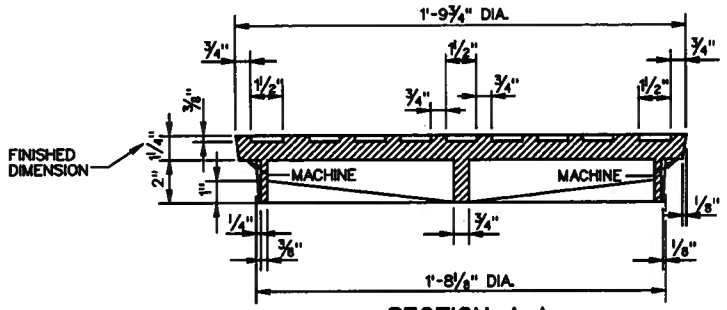
VDOT MH-1 (2) - MANHOLE [FOR REFERENCE]

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

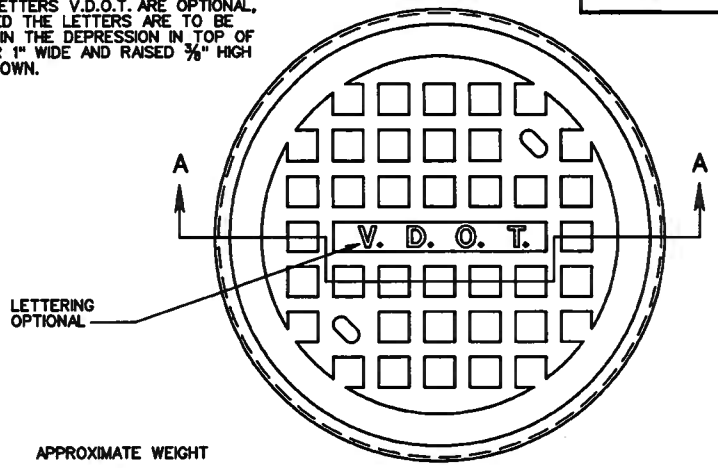
PROJECT NO.: 21156 DATE: 9/24/21

MH-1

NOTES:
THE LETTERS V.D.O.T. ARE OPTIONAL, IF USED THE LETTERS ARE TO BE CAST IN THE DEPRESSION IN TOP OF COVER 1" WIDE AND RAISED 3/8" HIGH AS SHOWN.



SECTION A-A

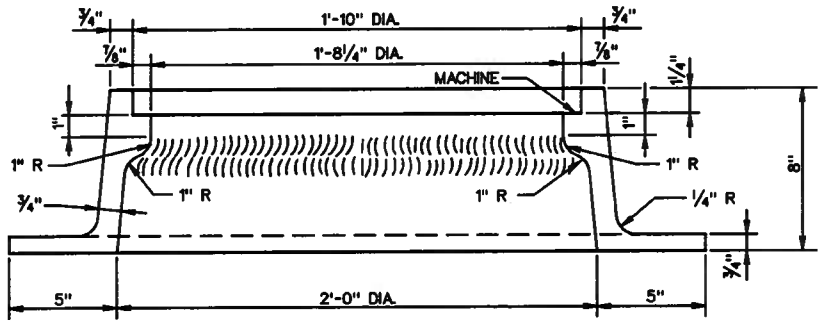


TOP

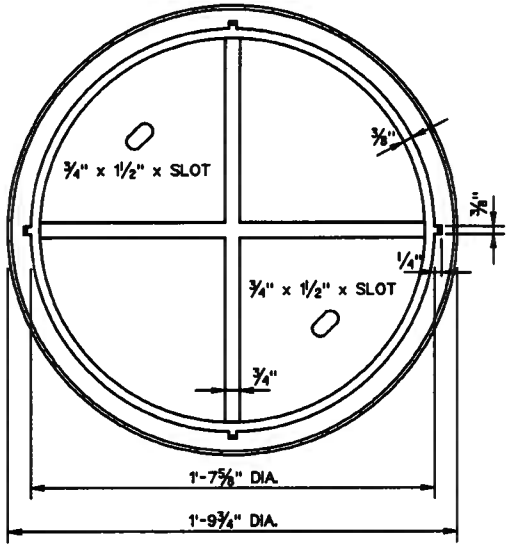
APPROXIMATE WEIGHT

CAST IRON

COVER 137 ± 7 LBS.
FRAME 235 ± 12 LBS.



FRAME SECTION AT MID POINT



BOTTOM

SPECIFICATION REFERENCE	STANDARD MANHOLE FRAME AND COVER	VDOT ROAD AND BRIDGE STANDARDS
224 302	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE SHEET 3 OF 5 106.03

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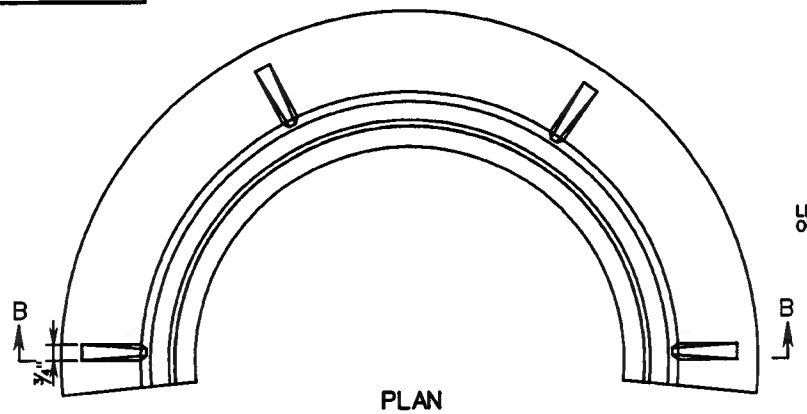
STORM SEWER IMPROVEMENTS

VDOT MH-1 (3) - MANHOLE [FOR REFERENCE]

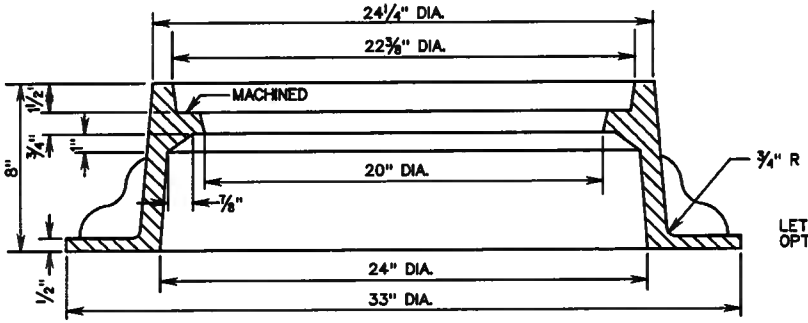
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

MH-1



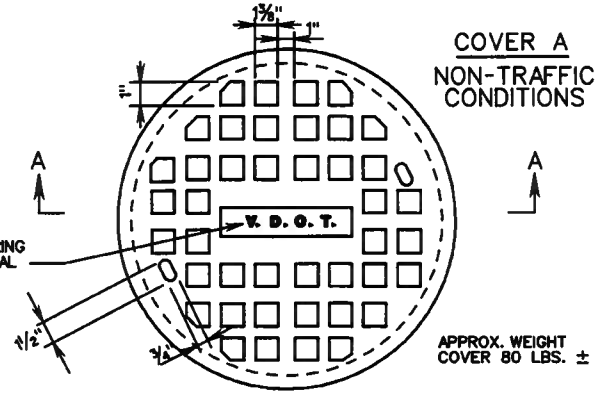
PLAN



FRAME

EITHER COVER A OR B MAY BE USED WITH FRAME.

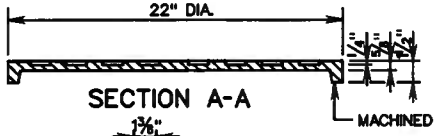
APPROX. WEIGHT
COVER 170 LBS. ±



COVER A

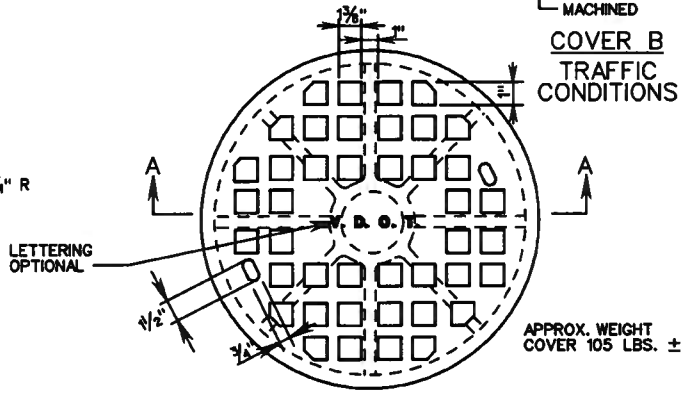
NON-TRAFFIC
CONDITIONS

APPROX. WEIGHT
COVER 80 LBS. ±



TOP

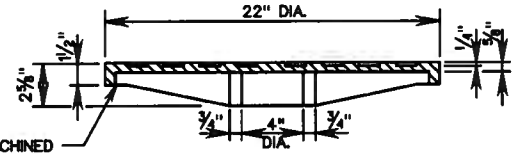
SECTION A-A



COVER B

TRAFFIC
CONDITIONS

APPROX. WEIGHT
COVER 105 LBS. ±



TOP

SECTION A-A

VDOT ROAD AND BRIDGE STANDARDS		STANDARD MANHOLE FRAME AND COVER	SPECIFICATION REFERENCE
SHEET 4 OF 5	REVISION DATE	VIRGINIA DEPARTMENT OF TRANSPORTATION	224 302
106.04			

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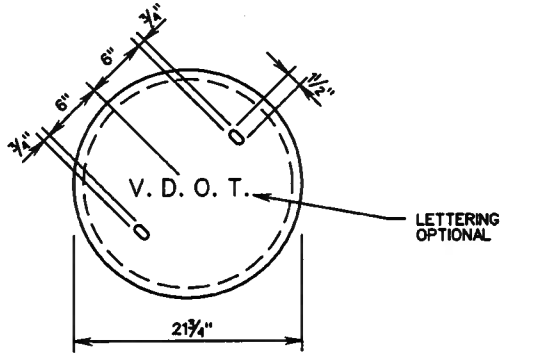
STORM SEWER IMPROVEMENTS

VDOT MH-1 (4) - MANHOLE [FOR REFERENCE]

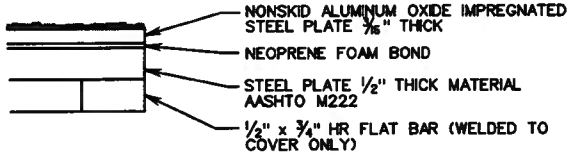
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

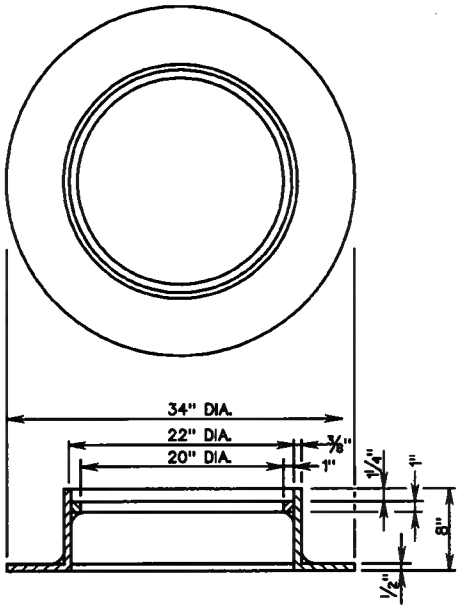
MH-1



MANHOLE COVER



DETAIL A



SECTION ℄
MANHOLE FRAME

NOTES:
STRUCTURAL COMPONENTS SHALL CONFORM TO AASHTO M222.

FRAME AND COVER SHALL HAVE A CONTINUOUS FLUSH FIT.

SPECIFICATION REFERENCE	STANDARD MANHOLE FRAME AND COVER	VDOT ROAD AND BRIDGE STANDARDS
302	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE / SHEET 5 OF 5 / 106.05

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STORM SEWER IMPROVEMENTS
VDOT MH-1 (5) - MANHOLE [FOR REFERENCE]
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

PB-1

GENERAL

1. METHOD "A" PIPE BEDDING SHALL BE USED FOR ALL TYPES OF PIPE CULVERTS WITHIN THE APPLICABLE HEIGHT OF COVER RANGE NOTED IN THE STANDARD PC-1 TABLES UNLESS OTHERWISE NOTED ON THE PLANS.
2. H = HEIGHT OF COVER MEASURED FROM TOP OF CULVERT TO FINISHED GRADE.
3. b = EXCAVATION DEPTH AS SHOWN ON PLANS OR TO FIRM BEARING SOIL.

CIRCULAR PIPE

1. D = OUTSIDE DIAMETER OF PIPE.
2. d = INSIDE DIAMETER OF PIPE.
3. X = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   X = 12" WHERE d IS LESS THAN 36".
   X = 18" WHERE d IS 36" AND GREATER.
4. WHERE DIRECTED BY THE ENGINEER. BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE (EXCEPT PLASTIC PIPE) 30" AND LESS IN DIAMETER WITH HEIGHT OF COVER 15' OR LESS.
5. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE (EXCEPT PLASTIC PIPE) 30" AND LESS IN DIAMETER WITH HEIGHT OF COVER 15' OR LESS.
6. BEDDING MATERIAL AND CLASS I BACKFILL MATERIAL MAY BE ELIMINATED FOR SHOULDER SLOT INLET (DI-13) OUTLET PIPES INSTALLATIONS.

ELLIPTICAL PIPE

1. S_1 = OUTSIDE SPAN DIMENSION OF PIPE.
2. S_2 = INSIDE SPAN DIMENSION OF PIPE.
3. R = OUTSIDE RISE DIMENSION OF PIPE.
4. X = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   X = 12" WHERE S_2 IS LESS THAN 36".
   X = 18" WHERE S_2 IS 36" AND GREATER
5. WHERE DIRECTED BY THE ENGINEER. BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE WHERE S_2 IS 38" OR LESS AND HEIGHT OF COVER 15' OR LESS.
6. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE WHERE S_2 IS 38" OR LESS AND HEIGHT OF COVER 15' OR LESS.

PIPE ARCH

1. S = SPAN DIMENSION OF PIPE.
2. R = RISE DIMENSION OF PIPE.
3. B = SEE PC-1 TABLE FOR APPLICABLE PIPE MATERIAL
4. x = WIDTH OF CLASS I BACKFILL MATERIAL BEYOND THE EXTREMITY OF THE PIPE.
   x = 12" WHERE S_2 IS LESS THAN 38".
   x = 18" WHERE S_2 IS 36" AND GREATER
5. WHERE DIRECTED BY THE ENGINEER. BEDDING MATERIAL MAY BE ELIMINATED FOR NORMAL EARTH FOUNDATIONS UNDER ROUTINE ENTRANCE PIPE WHERE S_2 IS 35" OR LESS AND HEIGHT OF COVER 15' OR LESS.
6. REGULAR BACKFILL MATERIAL MAY BE USED IN LIEU OF CLASS I BACKFILL MATERIAL FOR ALL FOUNDATION TYPES FOR ROUTINE ENTRANCE PIPE WHERE S IS 35" OR LESS AND HEIGHT OF COVER 15' OR LESS.

SPECIFICATION REFERENCE	INSTALLATION OF PIPE CULVERTS & STORM SEWERS GENERAL NOTES	VDOT ROAD AND BRIDGE STANDARDS
302 303	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE: SHEET 1 OF 1 107.00

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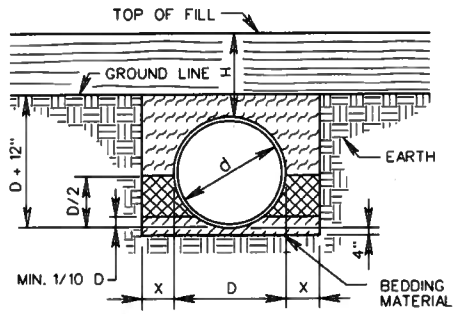
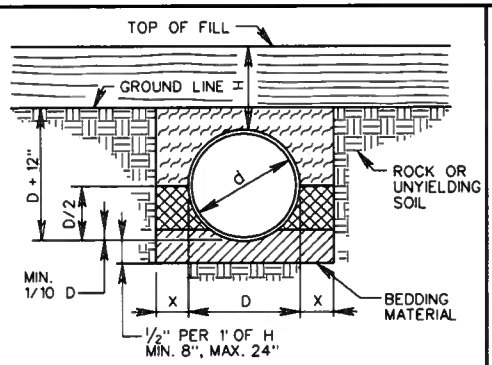
STORM SEWER IMPROVEMENTS
VDOT STD PB-1 (1) - PIPE BEDDING
SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES
PROJECT NO.: 21156 DATE: 9/24/21

PB-1

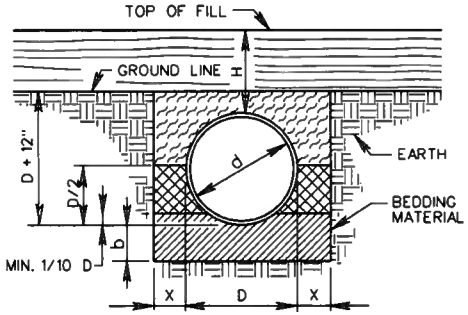
NO PROJECTION OF PIPE ABOVE GROUND LINE



NORMAL EARTH FOUNDATION

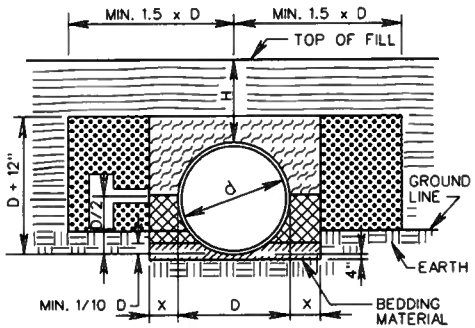


ROCK FOUNDATION

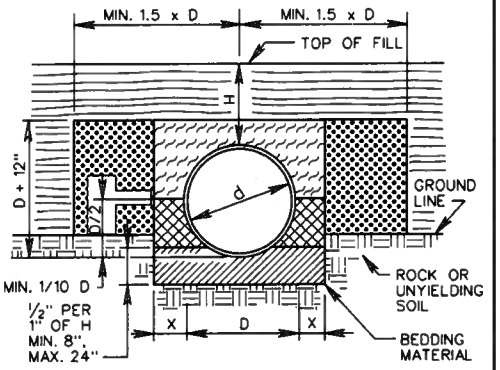


FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

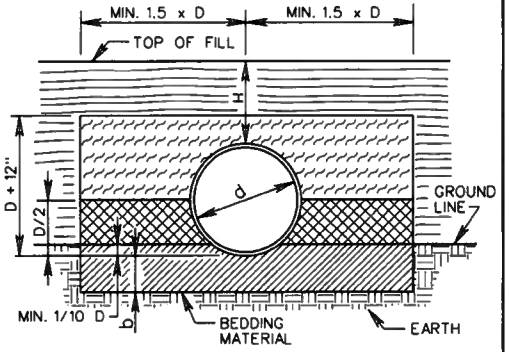
PIPE PROJECTION ABOVE GROUND LINE



NORMAL EARTH FOUNDATION



ROCK FOUNDATION



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

FOR PLASTIC PIPE CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

FOR ALL OTHER PIPE REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

EMBANKMENT

REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

NOTES:

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 4	REVISION DATE
107.01	07/12

INSTALL. OF PIPE CULVERTS AND STORM SEWERS CIRC. PIPE BEDDING AND BACKFILL - METHOD "A"

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
302
303

2016 ROAD & BRIDGE STANDARDS

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STORM SEWER IMPROVEMENTS

VDOT STD PB-1 (2) - PIPE BEDDING

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21

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STORM SEWER IMPROVEMENTS

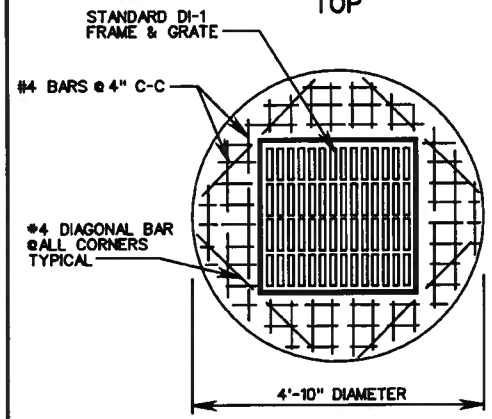
VDOT STD T-DI-1 - PRECAST TOP UNIT

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

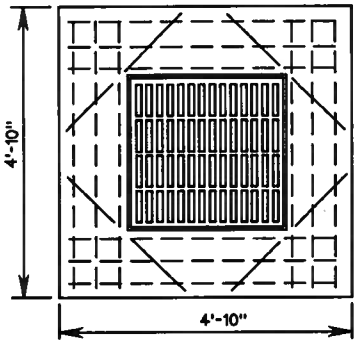
PROJECT NO.: 21156 DATE: 9/24/21

T-DI-1

TOP



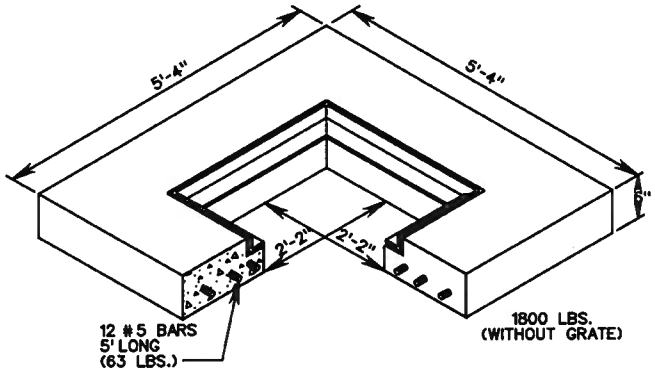
ALTERNATE TOP



RECOMMENDED MINIMUM HEIGHT CHART

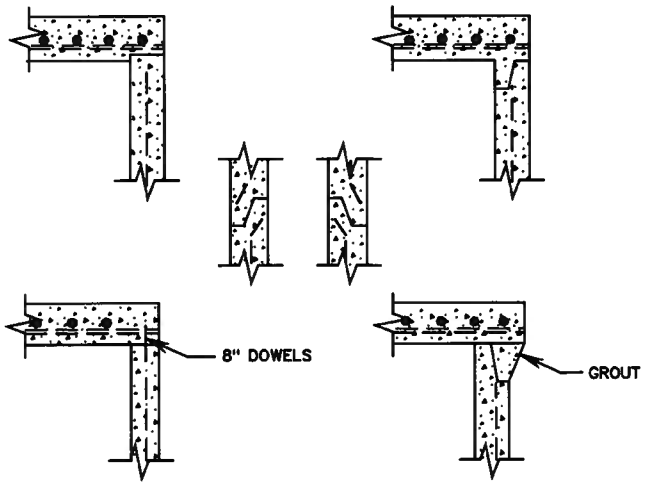
PIPE SIZE	H DIMENSION	
	CONCRETE	CORR. METAL
12"	2'-6"	2'-5"
15"	2'-9¼"	2'-8"
18"	3'-0½"	2'-11"
21"	3'-3¾"	3'-2"
24"	3'-7"	3'-5"

DI-1, 1A PC



NOTES:

1. SEE GENERAL NOTES PRECAST FOR ADDITIONAL DETAILS.
2. CONCRETE TO BE 4000 PSI MINIMUM.
3. REINFORCING STEEL IN ACCORDANCE WITH ASTM C-478, ASTM A-497 (WIRE FABRIC) AND ASTM A-615 (REINFORCING BARS).
4. CONCRETE COVER AND GRATE ARE TO BE FURNISHED AS A SINGLE UNIT.
5. SEE STANDARD DI-1, 1A FOR DETAILS OF FRAME AND GRATE.
6. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH MANUFACTURER.



NOTES:

1. TONGUE AND GROOVE JOINT TO BE OF FABRICATOR'S DESIGN MEETING THE APPROVAL OF THE ENGINEER. JOINTS ARE TO BE SEALED WITH MORTAR, OR O-RING GASKETS OR BUTYL RUBBER.
2. ALTERNATE JOINT DETAILS APPLY TO ALL PRECAST UNITS.

ALTERNATE JOINT DETAILS

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1	REVISION DATE
103.03	

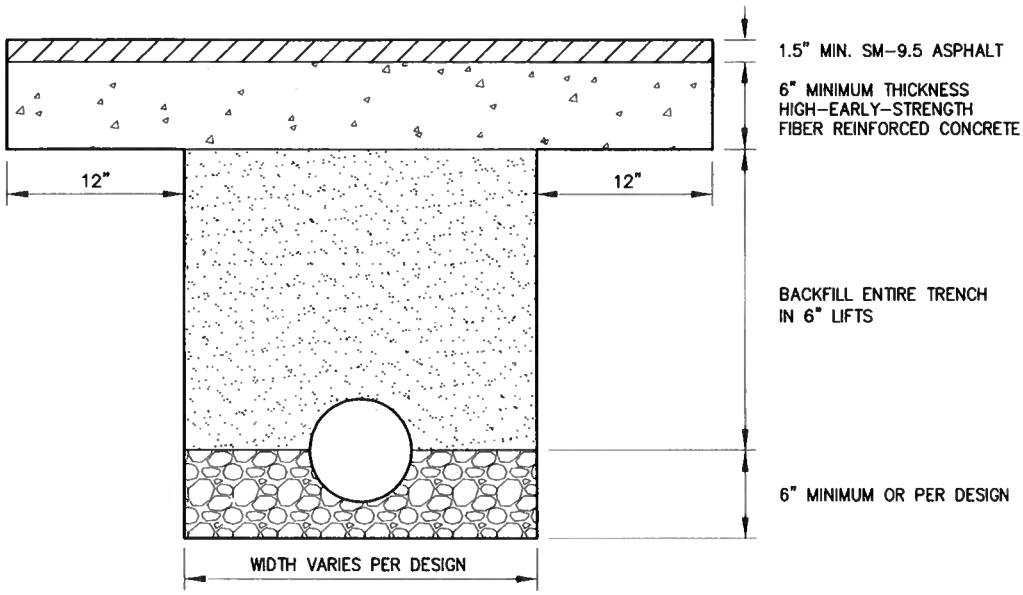
STANDARD PRECAST TOP UNITS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
233
302

REV. DATE: JUNE 2014



GENERAL NOTES:

1. BACKFILL TO BE PLACED AND COMPACTED ACCORDING TO VDOT ROAD AND BRIDGE SPECIFICATIONS SECTION 302 AND 303.
2. BACKFILL MATERIAL PER VDOT SPECIFICATIONS.
3. CERTIFICATION OF COMPACTION MUST BE SUBMITTED FROM A GEOTECHNICAL ENGINEERING FIRM.

PAVEMENT PATCHING DETAIL

For Open Pavement Cuts With a Width of 2'-0" or Less

NOTE: FOR OPEN PAVEMENT CUTS WITH A WIDTH GREATER THAN 2'-0", A PAVEMENT SECTION DESIGN MUST BE SUBMITTED TO THE PUBLIC WORKS DEPARTMENT FOR REVIEW AND APPROVAL.

SCALE: NTS | SHEET 1 OF 1

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STORM SEWER IMPROVEMENTS

SUFFOLK - PAVEMENT PATCHING DETAIL

SUFFOLK PUBLIC SCHOOLS – VARIOUS SITES

PROJECT NO.: 21156 DATE: 9/24/21