CITY OF NORTH LITTLE ROCK, ARKANSAS
COMMERCE DEPARTMENT
Amy Smith, Purchasing Manager

700 W. 29th St., North Little Rock, AR 72114
P.O. BOX 5757, North Little Rock, AR 72119
501-975-8881 Phone
501-975-8885 Fax

INVITATION TO BID/PROPOSAL COVER SHEET

Bid Number: 24-3870 Date Issued: July 21, 2024

Date & Time Bid Opening: Tuesday, July 30, 2024 @ 10:00am.

Louise Street
Drainage Improvements

Total Project Bid Price: $_____

Plans and specifications may be obtained from:

- Commerce Department at 700 W. 29th St, North Little Rock, AR 72114
- www.nlr.ar.gov click on the tab "Business," select "Bids and Vendors" and then choose "Open Bid Opportunities."
- Please direct all technical questions in writing to Michael Klamm at mklamm@nlr.ar.gov.
- General bid questions should be directed to the Commerce Department at 501-975-8881.

The City of North Little Rock encourages participation of small, minority, and woman own business enterprises in the procurement of goods, services, professional services, and construction, either as a general contractor or sub-contractor. It is further requested that whenever possible, majority contractors who require sub-contractors, seek qualified small, minority, and woman businesses to partner with them.

If you are obtaining this bid from our website, please be reminded that addendums may occur. It is therefore advisable that you review our listings for attachments including any changes to the bid.

Note: FAILURE TO FILL OUT AND SIGN THE INVITATION TO BID SHEET WILL RESULT IN REJECTION OF THE BID.

EXECUTION OF BID

Upon signing this page, the organization certifies that they have read and agree to the requirements set forth in this bid including conditions set forth and pertinent information requests.

Name of Firm:_____ Phone No.: _____

Arkansas Tax Permit No.:_____

Business Address: _____

Signature of Authorized Person: _____

Title:_____ Date: _____

GENERAL TERMS AND CONDITIONS FOR THE CITY OF NORTH LITTLE ROCK, AR

1. When submitting an "Invitation to Bid," the bidder warrants that the commodities covered by the bid shall be free from defects in material and workmanship under normal use and service. In addition, bidder must deliver new commodities of the latest design and model, unless otherwise specified in the "Invitation to Bid."

2. Prices quoted are to be net process, and when an error is made in extending total prices, the City may accept the bid for the lesser amount whether reflected by extension or by the correct multiple of the unit price.

3. Discounts offered will be taken when the City qualifies for such. The beginning date for computing discounts will be the date of invoice or the date of delivery and acceptance, whichever is later.

4. When bidding other than the brand and/or model specified in the "Invitation to Bid," the brand and/or model number must be stated by that item in the "Invitation to Bid," and descriptive literature be submitted with the bid.

5. **REJECTION**

   A. The City reserves the right to reject any or all Bids, to waive any minor informality or irregularity in any Bid, to negotiate changes and/or modifications with the lowest responsible bidder and to make award to the response deemed to be the most advantageous to the City. Bidders shall be required to comply with all applicable federal, state and local laws.

   B. The City reserves the right to cancel request for bids without penalty with it is in the best interest of the City. Notice of Cancellation shall be inserted on the City's website (www.nlr.ar.gov).

   C. Any Bid not conforming to the specifications or requirements set forth by the City in this Bid Request may be rejected.

   D. Bids may be also rejected if they are made by a Bidder that is deemed un-responsible due to lack of qualifications, capacity, skill, character, experience, reliability, financial stability or quality of services, supplies, materials, equipment or labor.

   E. The City of North Little Rock reserves the right to reject any and all bids, to accept in whole or in part, to waive any informalities in bids received, to accept bids on materials or equipment with variations from specifications in those cases where efficiency of operation will not be impaired, and unless otherwise specified by the bidder, to accept any item in the bid. If unit prices and extensions thereof do not coincide, the City of North Little Rock may accept the bid for the lesser amount whether reflected by the extension or by the correct multiple of the unit price

6. The Purchasing office reserves the right to award items, all or none, or by line item(s).

7. Quality, time and probability of performance may be factors in making an award.

8. Bid quotes submitted will remain firm for 30 calendar days from bid opening date; however, the prices may remain firm for a longer period of time if mutually agreeable between bidder and the Department of Commerce.

9. Bidder must submit a completed signed copy of the front page of the "Invitation to Bid" and must submit any other information required in the "Invitation to Bid."

10. In the event a contract is entered into pursuant to the "Invitation to Bid," the bidder shall not discriminate against any qualified employee or qualified applicant for employment because of race, sex, color, creed, national origin or ancestry. The bidder must include in any and all subcontracts a provision similar to the above.

11. Sales or use tax is not to be included in the bid price, but is to be added by the vendor to the invoice billing to the City. Although use tax is not to be included in this bid, vendors are to register and pay tax direct to the Arkansas State Revenue Department.

12. Prices quoted shall be "Free on Board" (F.O.B.) to destination at designated facility in North Little Rock. Charges may not be added after the bid is opened.

13. In the event of two or more identical low bids, the contract may be awarded arbitrarily or for any reason to any of such bidders or split in any proportion between them at the discretion of the Department of Commerce..

14. Specifications furnished with this Invitation are intended to establish a desired quality or performance level, or other minimum dimensions and capacities, which will provide the best product available at the lowest possible price. Other than designated brands and/or models approved as equal to designated products shall receive an equal consideration.

15. Samples of items when required, must be furnished free, and, if not called for within 30 days from date of bid opening, will become property of the City.

16. Bids will not be considered if they are:

    1. Submitted after the bid's opening time.
    2. Submitted electronically or faxed (unless authorized by Purchasing Agent).

17. Guarantees and warranties should be submitted with the bid, as they may be a consideration in making an award.

18. **CONSTRUCTION**

    A. Contractor is to supply the City with evidence of having and maintaining proper and complete insurance, specifically Workman's Compensation Insurance in accordance with the laws of the State of Arkansas, Public Liability and Property Damage. All premiums and cost shall be paid by the Contractor. In no way will the City be responsible in case of accident.

    B. When noted, a Certified check or bid bond in the amount of 5% of total bid shall accompany bid.

    C. A Performance Bond equaling the total amount of any bid exceeding $50,000.00 must be provided for any contract for the repair, alteration or erection of any public building, public structure or public improvement (pursuant to Arkansas Code Annotated Section 22-9-203).

19. **LIQUIDATED DAMAGES** - Liquidated damages shall be assessed beginning on the first day following the maximum delivery or completion time entered on this bid form and/or provided for by the plans and specifications.

20. **AMBIGUITY IN BID** - Any ambiguity in any bid as the result of omission, error, lack of clarity or non-compliance by the bidder with specifications, instructions, and all conditions of bidding shall be construed in the light most favorable to the City.

21. The bid number should be stated on the face of the sealed bid envelope. If it is not, the envelope will have to be opened to identify.

22. Whenever a bid is sought seeking a source of supply for a specified period of time for materials and services, the quantities of usage shown are estimated ONLY. No guarantee or warranty is given or implied by the participants as to the total amount that may or may not be purchased from any resulting contracts. These quantities are for the bidders information ONLY and will be used for tabulation and presentation of bid and the participant reserves the right to increase or decrease quantities as required.

23. The City of North Little Rock will follow procedures to check bidder eligibility through the federal System for Award Management (S.A.M.) as outlined in 2 C.F.R. § 200. This will be completed prior to the award of any contract in which federal grant funds will be expended.

24. Additional information or bid forms may be obtained from:

    COMMERCE DEPARTMENT, 700 West 29th Street, P.O. Box 5757, North Little Rock, Arkansas 72119 (501)975-8881
    www.nlr.ar.gov

Bidding documents must be submitted on or before the bid's opening date and time. Unless noted, bids must be sealed and mailed or delivered to:

Amy Smith, Purchasing Manager
Commerce Department
700 W. 29th Street, 3rd Floor
North Little Rock, AR 72114

BID FORM

NOTE TO BIDDER: Please use BLACK ink for completing this Bid form.

To. _____

Address: _____

_____

_____

Project Title: **LOUISE STREET**
DRAINAGE IMPROVEMENTS

Engineer's
Project No.: **CNLR ENGINEERING PROJECT NO. 24-07**

Date: _____ Arkansas Contractor's License No.: _____

Bidder: _____

Address: _____

Bidder's person to contact for additional information on this Bid:

Name: _____

Telephone: _____

ADDENDA

The Bidder hereby acknowledges that he/she has received Addenda Numbers:

_____ to these Specifications.
(Bidder insert number of each addendum received.)

INSURANCE AND BONDING REQUIREMENTS

The Bidder hereby acknowledges that he/she has read and understands the performance bond, payment bond, and insurance requirements for this project as specified in the General Conditions. If awarded a construction contract, the Bidder agrees to furnish the required bonds and insurance certificates within fifteen (15) days of the date the award is made.

Signature _____ Title _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Bid are those named herein, that this Bid is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Bid is made without any connection or collusion with any person submitting another Bid on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Bid is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Bid.

The Bidder further agrees that he has exercised his own judgment and has utilized all data which he believes pertinent from the Engineer, Owner, and other sources in arriving at his own conclusions.

The Bidder states that he has experience in and is qualified to perform the work herein specified and, if he does not have craftsmen experienced and qualified in any phase of the work for which this Bid is offered, that he will subcontract the work under said phase to a contractor who does have the necessary experience and qualifications.

CONTRACT EXECUTION AND BONDS

The Bidder agrees that if this Bid is accepted, he will, within 15 days after notice of award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner the Performance Bond and Payment Bond required herein, and will, to the extent of his Bid, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

CERTIFICATES OF INSURANCE, PAYMENT BOND, AND PERFORMANCE BOND

The Bidder further agrees to furnish the Owner, before executing the Contract, the certificates of insurance, Payment Bond, and Performance Bond as specified in these Documents.

START OF CONSTRUCTION, CONTRACT COMPLETION TIME, AND LIQUIDATED DAMAGES

Start of Construction, Contract Completion Time, and Liquidated Damages are stated in Document 00500 - Contract.

SALES AND USE TAXES

The Bidder agrees that all federal, state, and local sales and use taxes are included in the stated bid prices for the work.

UNIT PRICE BASE BID

Any Bid may be rejected which contains material omissions, or irregularities, or in which any of the unit prices are obviously unbalanced in the opinion of the Owner. Also, a bid may be rejected if, in any manner it shall fail to conform to the conditions of the published Bidding Requirements and Contract Documents.

The bidder agrees to accept as full payment for the work proposed herein the amount computed under the provisions of the Contract Documents and based on the following unit price amounts, it being expressly understood that the unit prices are independent of the exact quantities involved. The bidder agrees that the unit prices represent a true measure of the labor and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in the Contract Documents.

Item No.	Item Description	Units	Quantity	Unit Cost	Total Cost
1	Site Preparation	LS	1	$	$
2	Undercut Excavation	CY	60	$	$
3	42” HP Storm Pipe	LF	143	$	$
4	Curb Inlet	EA	1	$	$
5	Junction Box	EA	1	$	$
6	Trench and Excavation Safety Systems	LS	1	$	$
7	Topsoil	CY	30	$	$
8	Sodding	SY	275	$	$
9	Maintenance of Traffic	LS	1	$	$

***TOTAL BASE BID AMOUNT $_____**

_____

Words

BASIS OF AWARD

The Bidder understands that the Contract will be awarded to the most qualified bidder with the lowest Total Base Bid that the Owner may choose that makes the Project cost acceptable to the Owner. The Owner reserves the right to waive irregularities, reject bids, choose the most qualified bidder for the Project, and to postpone award of the Contract for a period of time which shall not exceed beyond 90 days from the bid opening date.

PAYMENT SCHEDULE

A detailed payment schedule for each structure or unit shall be submitted by the successful low Bidder. The successful low Bidder shall meet with the Engineer and Owner in North Little Rock, Arkansas, to review the format and details of the payment schedule. This meeting shall be held within 5 days of notification that the Contractor is the low Bidder. The purpose of the meeting shall be to establish an acceptable format for the payment schedule. The construction detailed payment schedule shall be completed by the Contractor 14 days after the meeting and submitted to the Engineer and Owner for review and approval. Failure of the Contractor to submit the payment schedule as required may result in the Owner's rejection of the Bid or delay in processing the Contractor's request for a progress payment.

SUBCONTRACTORS

The Bidder further certifies that proposals from the following subcontractors were used in the preparation of this Bid; and if awarded a contract, Bidder agrees to not enter into Contracts with others for these divisions of the Work without written approval from the Owner and Engineer.

Subcontractor	**Subcontractor**

Arkansas Contractor License #	Arkansas Contractor License #
Street Address, City, State, Zip Code	Street Address, City, State, Zip Code
Subcontractor	**Subcontractor**
Arkansas Contractor License #	Arkansas Contractor License #
Street Address, City, State, Zip Code	Street Address, City, State, Zip Code

SUPPLIERS/VENDORS

The Bidder shall list the suppliers/vendors where material for this Project will be purchased from and successful Bidder shall updated suppliers/vendors during construction of the Project.

Supplier/Vendor Name	**Supplier/Vendor Name**
Street Address, City, State, Zip Code	Street Address, City, State, Zip Code
Phone Number	Phone Number
Supplier/Vendor Name	**Supplier/Vendor Name**
Street Address, City, State, Zip Code	Street Address, City, State, Zip Code
Phone Number	Phone Number

PERFORMANCE OF WORK BY CONTRACTOR

The Bidder shall perform at least 40 percent of the work with his own forces (refer to Paragraph 24, INSTRUCTIONS TO BIDDERS. Bids from so called "Brokerage Contractors" will not be considered.) List below the items that the Bidder will perform with his own forces, if awarded this Contract, and fill in the blank showing the estimated total cost of these items.

Estimated total cost of the above items the Bidder states that will be performed with his own forces, if awarded Contract:

_____Dollars ($_____)

(Words)

EXPERIENCE OF BIDDER

The Bidder states that he is an experienced Contractor and has completed similar projects within the last 5 years. (List similar projects, with types, names of clients, construction costs, and references with telephone numbers. Use additional sheets if necessary.)

_____

_____

_____

_____

_____

SURETY

If the Bidder is awarded a construction Contract on this Bid, the Surety who provides the Performance and Payment Bond will be:

_____ whose address is:

_____

Street, City, State Zip Code

BIDDER

The name of the Bidder submitting this Bid is:

_____ doing business at:

_____

Street, City, State, Zip Code

which is the address to which all communications concerned with this Bid and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Bid, or of the partnership, or of all persons interested in this Bid as principals are as follows:

_____

_____

_____

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this _____ day of _____, 20___.

_____
Signature of Bidder

_____
Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this ____day of _____, 20___.

_____
Name of Corporation

(SEAL)

By_____

Title_____

Attest_____
Secretary

BID BOND

STATE OF ARKANSAS

KNOW ALL MEN BY THESE PRESENTS, that we:

_____

Principal and Contractor, and _____

_____

hereinafter called Surety, are held and firmly bound unto the **City of , Arkansas** and represented by its Mayor and City Council, hereinafter called Owner, in the sum of

_____DOLLARS ($_____)

lawful money of the United States of America, for the payment of which well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

WHEREAS, the Principal contemplates submitting or has submitted a bid to the Owner for the furnishing of all labor, materials (except those to be specifically furnished by the Owner), equipment, machinery, tools, apparatus, means of transportation for, and the performance of the work covered in the Bid and the detailed Drawings and Specifications, entitled:

LOUISE STREET
DRAINAGE IMPROVEMENTS
City Engineering Project No. 24-07
North Little Rock, Arkansas

WHEREAS, it was a condition precedent to the submission of said bid that a cashier's check, certified check, or bid bond in the amount of 5 percent of the base bid be submitted with said bid as a guarantee that the Bidder would, if awarded the Contract, enter into a written Contract with the Owner for the performance of said Contract within 15 consecutive calendar days after written notice having been given of the award of the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal within 15 consecutive calendar days after written notice of such acceptance enters into a written Contract with the Owner and furnishes a Contract Surety Bond in an amount equal to 100 percent of the base bid, satisfactory to the Owner, then this obligation shall be void; otherwise the sum herein stated shall be due and payable to the Owner and the Surety herein agrees to pay said sum immediately upon demand of the Owner in good and lawful money of the United States of America, as liquidated damages for failure thereof of said Principal.

IN WITNESS WHEREOF, the said_____, as Principal herein, has caused these presents to be signed in its name by its_____ and attested by its _____under its corporate seal, and the said _____ as Surety herein, has caused these presents to be signed in its name by its_____ _____ under its corporate seal, this _____ day of _____ A.D., 20__.

Signed, sealed and delivered
in the presence of:

_____
Principal-Contractor

_____

By_____

_____
As to Principal

_____
Title

_____

Surety

_____

_____
Attorney-in-Fact
(Power-of-Attorney to be Attached)

_____
As to Surety

By_____
Agent

ARDOT SPECIFICATIONS

GENERAL

The standard specifications of the Arkansas Department of Transportation (ARDOT) are bound in a book titled Standard Specifications for Highway Construction. These specifications are referred to herein as "Standard Specifications." The latest edition (2014) shall apply. A copy of these "Standard Specifications" may be obtained from the Arkansas Department of Transportation, Little Rock, Arkansas, at their customary charge.

INCORPORATION AND MODIFICATION

Certain parts of the Standard Specifications are appropriate for inclusion in these Technical Specifications. Such parts are incorporated herein by reference to the proper section or paragraph number. The individual specification numbers noted herein may be different from those in the latest edition of the "Standard Specifications." The most current specification number shall apply. Each such referenced part shall be considered to be a part of these Contract Documents as though copied herein in full.

Certain referenced parts of the Standard Specifications are modified in the Specifications that follow. In case of conflict between the Standard Specifications and the Specifications that follow, the Specifications that follow shall govern.

Individual material test numbers change from time to time. Use the latest applicable test.

Reference in the Standard Specifications to the “Department” are herein changed to the “Owner”.

END OF SECTION

SITE PREPARATION

DESCRIPTION

This item covers the preparation of the site for construction of the proposed improvements. The attention of the bidder is directed to the necessity for careful examination of the entire project site to determine, at the time of bid preparation, the full extent of work to be done under the item "SITE PREPARATION."

The item "SITE PREPARATION" shall include:

1. Mobilization/Demobilization
2. Contractor's Staging Areas
3. Contractor's Access
4. Ditch Clearing
5. Clean Up

CONSTRUCTION METHODS

MOBILIZATION/DEMOBILIZATION: The Contractor shall consider and include his cost for providing personnel, equipment, materials, bonds, etc. required for prosecution of the work under this item.

CONTRACTOR'S STAGING AREAS: The Contractor's staging area location shall be coordinated with the City Engineer and used by the Contractor to store materials/equipment, for employee parking, and for other purposes necessary to perform the work on this project. All areas used or otherwise occupied by the Contractor for his operations shall be cleaned and restored to their original condition prior to the final acceptance of the project by the Owner. All work involved in the preparation and restoration of areas used or occupied by the Contractor will not be measured for separate payment, but will be considered subsidiary to the bid item "SITE PREPARATION."

CONTRACTOR'S ACCESS: The Contractor’s access to the site shall be coordinated with the City Engineer. Before final acceptance of the project, any damage to the existing roads caused by the Contractor shall be repaired as directed by the Engineer. The repair of the existing roads will not be measured for separate payment but will be considered subsidiary to the item "SITE PREPARATION."

DITCH CLEARING: Before construction, the Contractor shall clear all obstructing vegetative and rock debris (including other foreign debris if applicable) from the ditch to provide clear access for all pipe construction activities. All work related to ditch clearing will not be measured for separate payment, but will be considered subsidiary to the bid item "SITE PREPARATION."

CLEAN UP: From time to time, the Contractor shall clean up the site in order that the site presents a neat appearance and that the progress of work will not be impeded. One such clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner. Cleanup will not be paid for directly but will be considered subsidiary to “SITE PREPARATION”.

MEASUREMENT AND PAYMENT

Site Preparation will be measured as a lump sum complete item. Work completed and accepted under this item will be paid for at the contract lump sum price bid for "SITE PREPARATION," which price shall be full compensation for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer.

Payment will be made under:

Site Preparation - per Lump Sum

END OF SECTION

CURB AND GUTTER REMOVAL

DESCRIPTION

This item shall consist of the sawcutting, removal, and disposal of portions of the existing curb and gutter, in accordance with these specifications and in conformity to the locations shown on the plans. All material removed shall be disposed of off-site.

CONSTRUCTION METHODS

GENERAL. No curb and gutter removal or repair shall be started until the work has been laid out and approved by the Engineer. All removed material shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its cost shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.

CURB AND GUTTER REMOVAL: The method of removal shall be approved by the Engineer before any removal operations begin. The Contractor shall take care not to damage adjacent pavement and curb and gutter which is to remain in place; any adjacent sound pavement damaged by the Contractor shall be removed and replaced at the contractor's expense.

Sawcutting will be required at the edge of the removal areas. The removal shall proceed to the depth necessary to remove the existing section or accommodate proposed construction. Removal of any additional material beyond the removal limits which is necessary to accommodate proposed construction will not be measured for separate payment.

MEASUREMENT AND PAYMENT

Curb and Gutter Removal will not be measured for separate payment but shall be considered subsidiary to pay items associated with curb inlet construction.

END OF SECTION

EXCAVATION

DESCRIPTION

This section addresses the requirements of all earthwork necessary for street and drainage construction. The work shall be performed in the areas shown in the Plans or as determined by the Engineer.

STANDARDS

All materials and work shall be in accordance with the the plans, or as directed by the Engineer, and with applicable portions of SECTION 210 – EXCAVATION AND EMBANKMENT and SECTION 212 – SUBGRADE of the Standard Specifications, except as modified or augmented herein.

MATERIALS

Unless otherwise noted in the Plans or directed by the Engineer, all excavated material shall become the property of the Contractor and shall be disposed of at an off-site location.

CONSTRUCTION METHODS

The Contractor shall keep the subgrade properly drained at all times by the use of pumps as required. Improperly drained subgrade will not be justification for undercut. The Engineer may require the exposed surface to dry before any judgment is rendered to the quality or workmanship of the exposed soils. The Contractor may be required to scarify/disk (to promote drying) and recompact the subgrade prior to determining whether undercut will be permitted. Regraded, recompacted, or reworked subgrade will not be considered for additional payment. Alternatively, the Contractor may elect to undercut saturated subgrade material at his own expense.

No contract time extensions will be granted to the Contractor for reworking wet subgrades retaining water due to improper grading or negligence by the Contractor. If proper drainage is not maintained during earthwork operations, the potential for undercut may be increased. Additional undercut required due to Contractor negligence will not be considered for payment.

Preparation of subgrade will not be measured for separate payment, but shall be considered subsidiary to the item of work involved.

Subgrade soils which the Engineer determines cannot be properly compacted shall be evaluated by the City's geotechnical engineer to determine depth of required undercut excavation and suitable replacement material. This excavated unsuitable material shall be disposed of off-site by Contractor.

OVER-EXCAVATION: Where excavation is carried below or beyond that required, the space shall be filled to grade with suitable material and thoroughly compacted as directed by the Engineer. The Contractor will not be entitled to additional compensation for such over-excavation or the necessary refilling, unless the Owner or its representative is responsible for the error.

MISCELLANEOUS: If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take

all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor shall, at his/her own expense, satisfactorily repair or pay the cost of all damage to such facilities or structures which may result from any of the Contractor's operations during the period of the contract.

MEASUREMENT AND PAYMENT

E2-5.1 Excavation will not be measured for separate payment but shall be considered subsidiary to pay items requiring construction of storm pipe and storm inlet boxes.

E2-5.2 Undercut shall be paid for at the contract unit price bid per cubic yard for "UNDERCUT EXCAVATION" at the depth field-determined by the City's geotechnical engineer, which price shall be full compensation for all undercut excavation; for disposal or placement of unsuitable material including loading, hauling, spreading, and compaction; for approved suitable replacement material; for additional stabilization fabric if determined necessary; for the refilling, rolling, and compaction of all undercut areas with approved suitable material; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Undercut Excavation – per cubic yard

END OF SECTION

CLASS 7 AGGREGATE

DESCRIPTION

This section covers all work in connection with the construction of Class 7 aggregate in accordance with the details as shown in the Plans or as directed by the Engineer.

STANDARDS

Material and work (including testing) for aggregate base course shall be in accordance with SECTION 303 – AGGREGATE BASE COURSE of the Standard Specifications for Class 7, except as modified or augmented herein.

CONSTRUCTION METHODS

TESTS: Material will be acceptable from quarries or crushing plants which currently are, or recently have been, supplying material meeting the Standard Specifications for Class 7 aggregate. In-place density shall be determined by AASHTO T 310, Direct Transmission of not less than 95% of maximum density determined in the laboratory by AASHTO T 180, Method D.

MAINTENANCE: The Contractor shall maintain the Class 7 aggregate until and during the construction of the subsequent overlying construction materials. Defects that develop in the base course shall be repaired by the Contractor at the Contractor's expense.

MEASUREMENT AND PAYMENT

Class 7 aggregate for undercut including furnishing, placement, compaction, watering, and all labor, tools, equipment and incidentals necessary to complete the work will not be measured for separate payment but shall be considered subsidiary to associated pay items.

END OF SECTION

PIPE CULVERTS

DESCRIPTION

This section covers construction of polypropylene storm pipe at the location shown on the plans.

STANDARDS

Materials and work shall be in accordance with the included HP Storm Pipe specifications and SECTION 606 – PIPE CULVERTS of the Standard Specifications, except as modified or augmented herein.

MATERIALS

Pipe and pipe connection accessories shall be in accordance with the included HP Storm Pipe specifications.

CONSTRUCTION METHODS

TRENCHING AND BACKFILL: Trenching and backfill shall be in accordance with applicable requirements of the included HP Storm Pipe Specifications, SECTION 606 – PIPE CULVERTS of the Standard Specifications and TRENCH AND EXCAVATION SAFETY SYSTEMS of these specifications, except as modified or augmented herein.

Where unsuitable material is encountered, excavation shall continue until a firm material is reached and the over-excavation filled to grade with Class 7 aggregate in accordance with the provisions of the EXCAVATION specification.

NSTALLATION OF PIPE: The installation of pipe shall be in accordance with the included HP Storm Pipe specifications and SECTION 606 – PIPE CULVERTS of the Standard Specifications, except as modified or augmented herein.

The pipe ends (where jointing occurs) shall be cleaned and maintained clean. The joint shall be constructed as recommended by the manufacturer of the pipe. Each section of pipe shall be examined carefully before being laid, and the defective or damaged sections shall not be used. Pipelines shall be laid to match flow lines at existing connections.

Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Full responsibility for the diversion of drainage and for dewatering of trenches during construction shall be borne by the Contractor.

All pipe in place shall be approved by the Engineer before being backfilled. In all backfilling operations, the Contractor shall be responsible for preventing damage to or misalignment of the pipe.

Pipe embedment and bedding shall be furnished, placed, and shaped as described in the HP Storm Pipe Specification.

METHOD OF MEASUREMENT

Pipe culverts will be measured by the linear foot in place, completed and accepted. Length shall be measured along the entire distance between connections at proposed storm inlets. Measurements will be taken to the nearest linear foot.

Excavation (not including undercut), bedding, embedment and backfill, will not be measured separately, but will be considered subsidiary to installation of "42" HP Storm Pipe".

BASIS OF PAYMENT

Pipe culvert acceptably completed and measured as provided above will be paid for at the contract unit price per linear foot bid for "42" HP Storm Pipe" which price shall be full compensation for furnishing all materials (including bedding, embedment, backfill, and pipe accessories); for all excavating, trenching, removing, hauling, backfilling, and compacting; and for all equipment, tools, labor, and incidentals necessary to complete the work.

END OF SECTION

HP STORM 12”- 60” PIPE SPECIFICATION

Scope
This specification describes 12- through 60-inch (300 to 1500 mm) HP Storm pipe for use in gravity-flow storm drainage applications.

Pipe Requirements
HP Storm pipe shall have a smooth interior and annular exterior corrugations.
- 12- through 60-inch (300 to 1500 mm) pipe shall meet ASTM F2881 or AASHTO M330
- Manning’s “n” value for use in design shall be 0.012

Joint Performance
Pipe shall be joined using a bell & spigot joint meeting the requirements of ASTM F2881 or AASHTO M330. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

Fittings
Fittings shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.

Field Pipe and Joint Performance
To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F1417 or ASTM F2487. Appropriate safety precautions must be used when field-testing any pipe material. Contact the manufacturer for recommended leakage rates.

Material Properties
Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.

Installation
Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in traffic areas for 12- through 48-inch (300 to 1200 mm) diameters shall be one foot (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft. (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD), or Class 3 (minimum 95%) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.04. Contact your local ADS representative or visit our website at
www.adspipe.com for a copy of the latest installation guidelines.

Build America, Buy America (BABA)
HP Storm pipe (per AASHTO), manufactured in accordance with ASTM F2881 or AASHTO M330, complies with the requirements in the Build America, Buy America (BABA) Act.

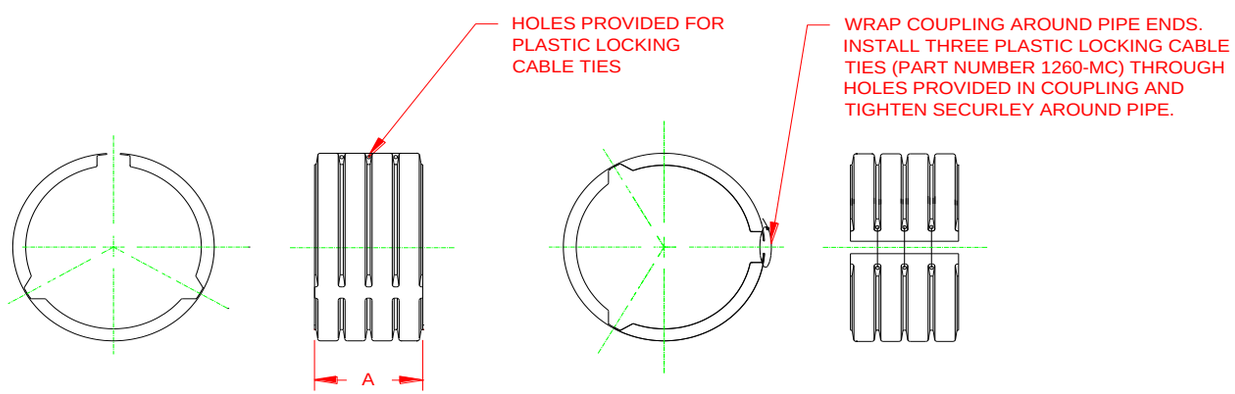
Pipe Dimensions

Nominal Pipe I.D. in (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Average Pipe I.D. in (mm)	12.2 (310)	15.1 (384)	18.2 (462)	24.1 (612)	30.2 (767)	36.0 (914)	42.0 (1067)	47.9 (1217)	59.9 (1521)
Average Pipe O.D. in (mm)	14.5 (368)	17.7 (450)	21.4 (544)	28.0 (711)	35.5 (902)	41.5 (1054)	47.4 (1204)	54.1 (1374)	67.1 (1704)
Minimum Pipe Stiffness * @ 5% Deflection #/in./in. (kN/m^2)	75 (517)	60 (414)	56 (386)	50 (345)	46 (317)	40 (276)	35 (241)	35 (241)	30 (207)

*Minimum pipe stiffness values listed; contact a representative for average values.

HP STORM DUAL WALL SPLIT COUPLER
12" - 60" DIAMETER

PART #	PIPE SIZE	A
1265AC	12 in (300 mm)	7.7 in (195 mm)
1565AC	15 in (375 mm)	10.4 in (263 mm)
1865AC	18 in (450 mm)	10.7 in (272 mm)
2465AC	24 in (600 mm)	12.6 in (320 mm)
3065AA	30 in (750 mm)	16.5 in (419 mm)
3661AA	36 in (900 mm)	21.0 in (533 mm)
4265AA**	42 in (1050 mm)	20.8 in (527 mm)
4865AA**	48 in (1200 mm)	21.0 in (533 mm)
6065AA**	60 in (1500 mm)	24.0 in (610 mm)



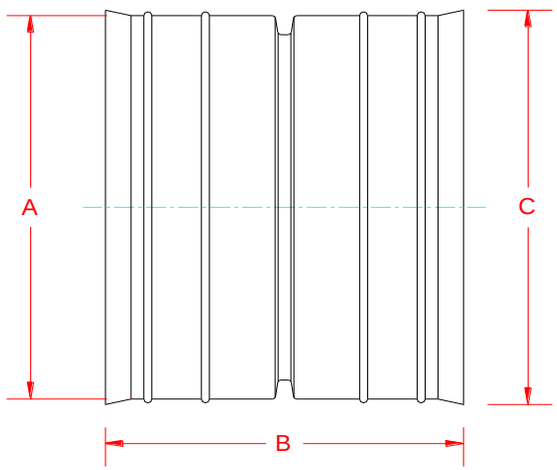
NOTE: ALL FITTINGS DIMENSIONS ARE FOR REFERENCE ONLY

Advanced Drainage Systems, Inc.

DRAWING #:	HP 8000	
DRAWN BY:	TJR	10/21/2009
APPROVED BY:		
REVISIONS:	TJR	4/19/2016

HP STORM DUAL WALL BELL\BELL COUPLERS
12" - 24" DIAMETER (POLYPROPYLENE)

PART #	PIPE SIZE	A	B	C	JOINT
1215AAPP	12 in (300 mm)	14.6 in (371 mm)	14.0 in (356 mm)	15.4 in (391 mm)	WT
1515AAPP	15 in (375 mm)	17.8 in (451 mm)	16.0 in (406 mm)	18.6 in (472 mm)	WT
1815AAPP	18 in (450 mm)	21.4 in (544 mm)	18.0 in (457 mm)	22.4 in (569 mm)	WT
2415AAPP	24 in (600 mm)	28.2 in (716 mm)	14.8 in (376 mm)	29.3 in (743 mm)	WT



* REQUIRES GASKET TO PROVIDE SPECIFIED JOINT PEROFRMANCE

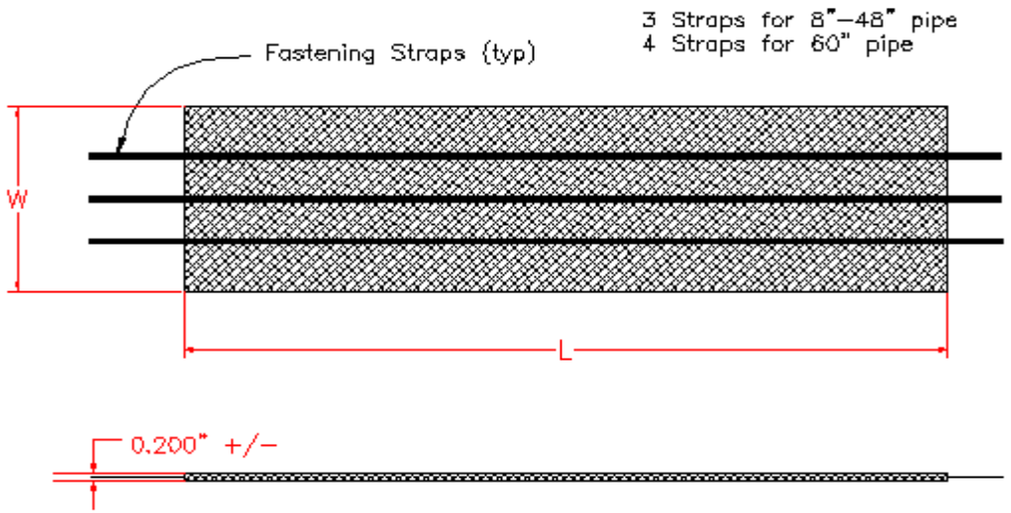
NOTE: ALL FITTINGS DIMENSIONS ARE FOR REFERENCE ONLY

Advanced Drainage Systems, Inc.

DRAWING #:	HP 8100	
DRAWN BY:	TJR	10/21/2009
APPROVED BY:		
REVISIONS:	TJR	5/13/2014

HP STORM DUAL WALL MARMAC COUPLERS
12" - 60" DIAMETERS

PART #	PIPE SIZE	L	W
1267RC	12 in (300 mm)	52.0 in (1321 mm)	7.0 in (178 mm)
1567RC	15 in (375 mm)	62.0 in (1575 mm)	10.0 in (254 mm)
1867RC	18 in (450 mm)	75.0 in (1905 mm)	10.0 in (254 mm)
2467RC	24 in (600 mm)	94.0 in (2388 mm)	12.0 in (305 mm)
3067RC	30 in (750 mm)	125.0 in (3175 mm)	15.0 in (381 mm)
3667RC	36 in (900 mm)	141.0 in (3581 mm)	18.0 in (457 mm)
4267RC	42 in (1050 mm)	161.0 in (4089 mm)	20.0 in (508 mm)
4867RC	48 in (1200 mm)	183.0 in (4648 mm)	20.0 in (508 mm)
6067RC	60 in (1500 mm)	222.0 in (5639 mm)	28.0 in (711 mm)



NOTE: ALL DIMENSIONS ARE NOMINAL

Advanced Drainage Systems, Inc.

DRAWING #:	HP 8200	
DRAWN BY:	TJR	10/21/2009
APPROVED BY:		
REVISIONS:	TJR	5/13/2014

Technical Note

TN 5.05 Pipe Flotation

Introduction

The light weight of high density polyethylene (HDPE) and polypropylene (PP) pipe make it desirable because of the ease of handling and installation but this same benefit also makes these thermoplastic pipes prone to flotation. All pipe products, such as concrete and corrugated metal, are prone to flotation under the right circumstances. In fact, all pipe materials and other buried structures are subject to flotation. When the uplift on the pipe or structure exceeds the downward force of the weight and load it carries, the pipe (or structure) will rise or heave. Where flotation is a possibility, proper installation and/or anchoring of the pipe is critical. This document provides an analysis on minimum cover heights required to prevent pipe flotation for thermoplastic pipe sizes 12”-60”. Buoyant force due to flowable fill is also discussed.

Hydrostatic Uplift Due to a High Water Table

Buoyancy becomes an issue in buried pipe when the groundwater encroaches into the pipe zone. For projects where a high groundwater table or water surrounding the pipe is expected, precautions should be taken to prevent the floatation of thermoplastic pipe. The vertical hydrostatic uplift force, due to the water table, must be balanced by the soil overburden and the weight of the pipe in order to prevent flotation of the pipe. The vertical hydrostatic uplift force, U, can be calculated from Equation 1 below:

$$U = \frac{\pi}{4} D^2 \delta_w \qquad (1)$$

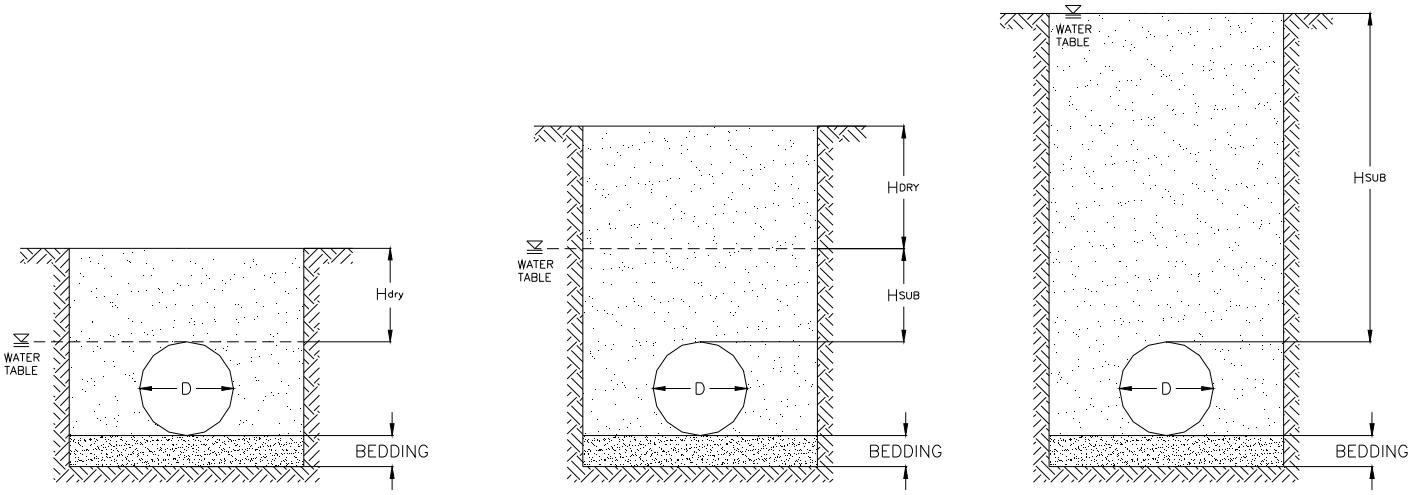
where U = lb/linear ft of pipe
D = O.D. of the pipe in question, ft.
δ_w = unit weight of water = 62.4 lb/ft^3

Soil loads experienced by a pipe at varying water table depths (W_{soil}) can be calculated from Equation 2. Figure 1 illustrates each of the three cases seen in field installations where buoyancy becomes a concern, and also clarifies all of the parameters contained within Equation 2.

$$W_{soil} = \delta_{dry} H_{dry} D + (\delta_{sat} - \delta_w)(H_{sub} + 0.1073D)D \quad (2)$$

where W_{soil} = weight of soil overburden, lb/linear ft of pipe
δ_{dry} = dry unit weight of the soil, lb/ft^3
H_{dry} = depth of dry soil, ft.
H_{sub} = depth of submerged soil over top of pipe, ft.
δ_{sat} = saturated unit weight of the soil, lb/ft^3
$\delta_{sat} - \delta_w$ = submerged unit weight of the soil, lb/ft^3

Figure 1
Installation Conditions for Possible Flotation of Thermoplastic Pipe



(a) Water table at pipe crown

(b) Water table exceeds pipe crown elevation

(c) Water table is at ground surface

The typical weights (W_{pipe}) and average outside diameters are shown in Table 1.

Table 1
Approximate Weights of ADS Thermoplastic Pipe

Nominal Diameter in. (mm)	Nominal OD in. (mm)	Dual Wall Pipe Weight lb/ft (kg/m)	Triple Wall Pipe Weight lb/ft (kg/m)
4 (100)	4.6 (117)	0.44 (0.6)	N/A
6 (150)	7.0 (178)	0.85 (1.3)	N/A
8 (200)	9.5 (241)	1.5 (2.2)	N/A
10 (250)	12 (305)	2.1 (3.1)	N/A
12 (300)	14.5 (368)	3.2 (4.7)	N/A
15 (375)	18 (457)	4.6 (6.8)	N/A
18 (450)	22 (559)	6.4 (9.5)	N/A
24 (600)	28 (711)	11.0 (16.4)	N/A
30 (750)	36 (914)	15.4 (22.9)	20.7 (30.8)
36 (900)	42 (1067)	19.8 (29.4)	24.2 (36.0)
42 (1050)	48 (1219)	26.4 (39.3)	31.9 (47.5)
48 (1200)	54 (1372)	31.3 (46.6)	41.8 (62.3)
60 (1500)	67 (1702)	45.2 (67.3)	55.0 (81.9)

N/A indicates the pipe is not available in the respective diameter

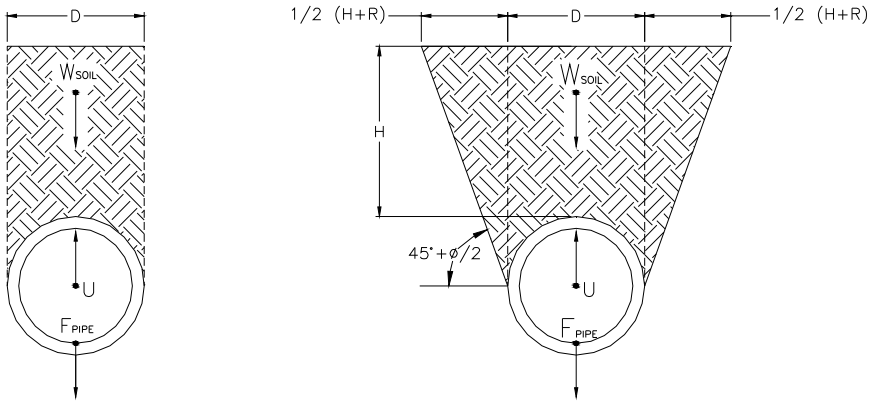
The minimum depth of cover (H) required to resist uplift can be calculated by equating the sum of the downward forces to the sum of the upward or buoyant forces. While there are varying methods to account for soil load distribution on the pipe, for conservative minimum cover requirements, the soil load is assumed to be the soil column directly above the outside diameter of the pipe as illustrated in Figure 2(a). Therefore, minimum cover is calculated using Equations 3 and 4 below:

$$U \leq W_{Soil} + W_{Pipe} \qquad (3)$$

where W_{pipe} = weight of the pipe, lb/linear ft of pipe

$$H = H_{dry} + H_{sub} \qquad (4)$$

Figure 2
Forces Affecting Flotation



(a) Soil Column Loading Conditions (b) Prism Loading Conditions

Table 2
Minimum Recommended Cover to Prevent Flotation of ADS Thermoplastic Pipe

Nominal Diameter in. (mm)	Minimum Cover in. (mm)
4 (100)	3 (77)
6 (150)	4 (102)
8 (200)	5 (127)
10 (250)	7 (178)
12 (300)	9 (228)
15 (375)	11 (280)
18 (450)	13 (330)
24 (600)	17 (432)
30 (750)	22 (559)
36 (900)	25 (635)
42 (1050)	29 (737)
48 (1200)	33 (838)
60 (1500)	40 (1016)

Calculation Notes:

1. The pipe is assumed to be empty. This not only simplifies the calculations but creates a condition that would encourage flotation. Unless the system is constructed to be watertight, this condition would not likely be found in an actual installation.
2. The outside diameter of the corrugated pipe was used to determine soil and water displacement.
3. Saturated soil density used was 130 pcf which is typical for many saturated soil mixtures. Soils of greater densities will reduce the chance of flotation.
4. The water table was assumed to be at the ground surface, as illustrated in Figure 1(c), simulating a fully saturated soil. This assumption creates a “worst case” condition to yield more conservative results.
5. The soil load prism shown in Figure 2(a) was used to determine soil weight.
6. For structural purposes, a minimum cover of 12” (0.3m) shall apply for 4”-48” (100-1200mm) pipe, and 24” (0.6m) for 60” (1500mm) pipe.

Example 1: Calculate the minimum depth of cover required to prevent 48" N-12 HDPE from floating when the water table is at the top of grade. The dry and saturated unit weights of the soil are 110 lb/ft³ and 130 lb/ft³, respectively.

Solution: U O W_{Soil} + W_{Pipe}

W_{pipe} = 32.0 lb/ft (from Table 1)

$$U = \frac{\pi}{4}(4.5)^2(62.4) = 992.4 \text{ lb/ft}$$

The water table is at top of grade, so Figure 1(c) applies. Since H_{dry}=0, the first term in Equation 2 is eliminated:

Therefore, $W_{soil} = (130 - 62.4)[H_{sub} + (0.1073)(4.5)](4.5) + 32 = 304.2\ H_{sub} + 146.9 + 32$

Equation 3 then yields: $992.4 = 304.2\ H_{sub} + 178.9$

$\therefore H_{sub} = 2.67' = 32.1"$ (use 33")

Finally, calculate minimum cover from Equation 4: **$H = H_{sub}$ = 33"**

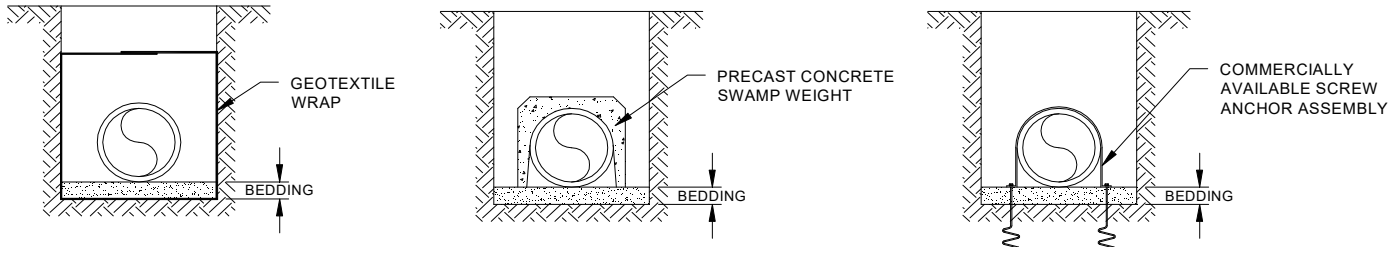
The above calculations are conservative. The angle of internal friction of the soil, ϕ, and the coefficient of lateral earth stress, K_o, are not accounted for in the above equations. These parameters are best left to the geotechnical engineer. If these parameters are added to the above calculations, the depth of cover required would be reduced.

Anchoring Systems

In many instances pipe flotation may simply be addressed with adequate cover. In those situations where adequate cover cannot be achieved, there are a number of acceptable alternate methods for restraining the pipe. Several examples are shown in Figure 3.

Due to the variations in in-situ soil densities, water table heights, and the restraining force of the anchors, the Engineer should evaluate the project-specific conditions to determine the required anchor type and spacing to prevent flotation. The maximum spacing between anchor supports should not exceed 10 feet. In this manner, pipe is supported at each joint and at the midpoint of each length of pipe to ensure adequate stabilization.

Figure 3
Pipe Stabilizing Alternatives



(a) Geotextile wrap (b) Concrete collar (c) Screw anchor

Uplift Due to Flowable Fill Backfill

Flowable fill, also known as controlled low strength material (CLSM), controlled density fill (CDF), and slurry fill, is utilized as an alternate to compacted granular fill. Flowable fill typically consists of Portland Cement, sand, water, and fly ash. Uplift due to CLSM backfill can be calculated from Equation 5.

$$U = \frac{A_{disp}\delta_{FF}}{144} \qquad (5)$$

Where, A_{disp} = Area of pipe displaced by flowable fill, in^2
δ_{FF} = Unit weight of flowable fill, lb/ft^3
U = Uplift due to flowable fill backfill, lb/ft

Due to the vast differences in the unit weights between water and flowable fill, uplift caused by flowable fill can be greater than two times that of hydrostatic uplift. When backfilling with flowable fill, the pipe will float in the absence of soil overburden, since the weight of the pipe will not offset the vertical uplift. Precautions must be taken to ensure the pipe remains on its intended alignment and grade. This is commonly done by anchoring the pipe in place or placing the flowable fill in incremental lifts. Refer to Technical Note 5.02: Flowable Fill Backfill for Thermoplastic Pipe for common anchoring methods and additional technical information related to placing flowable fill as backfill.

DROP INLETS AND JUNCTION BOXES

DESCRIPTION

This section covers all work in connection with the construction of inlets and junction boxes in accordance with the locations and details shown on the Plans and with these Specifications.

STANDARDS

All work under this section shall be done in accordance with SECTION 609 – DROP INLETS AND JUNCTION BOXES of the Standard Specifications, except as modified or augmented herein.

MATERIALS

Cement, aggregate, water, additives, and reinforcing steel shall conform to the requirements for materials as provided in SECTION S-1 – STRUCTURAL CONCRETE of these specifications.

Materials other than those described above shall be in conformity with paragraph 609.02 – Materials of the Standard Specifications.

CONSTRUCTION METHODS

Forms, concrete, and reinforcing steel shall be in accordance with applicable requirements of SECTION S-1 – STRUCTURAL CONCRETE and with additional stipulations as follows:

1. Inside wall forms shall be removed prior to the erection of forms for top slabs. The supports for top slab forms shall be positioned in such a manner that will result in a minimum of interference with the free flow of water.

2. Manhole rings and covers shall conform to the details in the Plans and to applicable portions of SECTION 609 – DROP INLETS AND JUNCTION BOXES of the Standard Specifications.

METHOD OF MEASUREMENT

Completed and accepted inlets and junction boxes will be measured by the completed structure.

BASIS OF PAYMENT

Work completed and accepted under this section and measured as provided above will be paid for at the Contract Unit Price bid for each for the items listed below, which price shall be full compensation for constructing the item; for all excavation and backfill; and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

Payment will be made under:

a. Curb Inlet - per Each
b. Junction Box - per Each

END OF SECTION

EXCAVATION FOR STRUCTURES

DESCRIPTION

This section covers the removal of all materials of whatever nature necessary for the construction of drainage inlet structures. All work shall be in accordance with details shown on the Plans, or as directed by the Engineer, and with these specifications.

The work involved in unclassified excavation for structures shall be in accordance with the EXCAVATION specification, except as modified or augmented herein.

MATERIALS

Backfill materials shall meet the applicable requirements of the EXCAVATION specification. Such material shall be free from frozen material, trash, lumber, broken pieces of concrete having any dimension greater than two (2) inches, broken concrete in nests regardless of dimensions, or other debris. Such material shall be susceptible to proper compaction.

CONSTRUCTION METHODS

EXCAVATION FOR STRUCTURES:

Areas of excavation for inlets and junction boxes shall be large enough to permit proper construction of the structures, and except that they shall not extend more than eighteen (18) inches outside the structures, unless authorized by the Engineer.

BACKFILL: Backfill shall be made from suitable available structural excavation materials.

Backfill shall be compacted to a density not less than ninety-five (95) percent of the maximum density, at optimum moisture, obtained in the laboratory in accordance with AASHTO Designation T99. Samples for laboratory tests and field determinations will be taken by the Contractor.

Backfill shall not be placed against concrete structures until the expiration of the curing periods specified in the STRUCTURAL CONCRETE specification.

Compacting shall be obtained by the use of pneumatic or mechanically actuated tampers. Gravity hand tampers will not be acceptable. Backfill material shall be sprinkled or aerated as necessary to assure the required density.

Backfill of structures, other than pipe, shall be made with reasonable uniformity around and along the structure. It shall be placed in 6 inch layers, loose measurement and each layer compacted.

Backfill will not be measured for separate payment. Placing and compacting of backfill shall be considered subsidiary to associated work.

DISPOSAL OF EXCAVATED MATERIAL: Excavated material unsuitable for use, or in excess of needs, shall be disposed of by the Contractor off-site.

MEASUREMENT AND PAYMENT

Excavation for structures will not be measured for separate payment, but will be considered subsidiary work pertaining to the construction of the items.

END OF SECTION

INLET STRUCTURE BEDDING

DESCRIPTION

This section covers the furnishing of all labor, equipment, and materials necessary for placing inlet structure foundations as required on the Plans or as deemed necessary by the Engineer.

MATERIALS

Materials for inlet bedding or embedment shall be as follows:

Installed inlet structures shall be bedded in Class 7 stone, or an approved equal meeting the following gradation:

Sieve (Square Opening)	Percent Passing
1 ½"	100
1"	90-100
¾"	40-75
½"	15-35
3/8"	0-15
#4	0-5

All bedding material shall adhere to the following requirements:

(1) Deleterious substances shall not be present in the prepared crushed stone in excess of the following amounts:

Soft and friable pieces - 5%
Material finer than No. 200 - 1%
Clay lumps - 0.5%

(2) The percentage of wear of the crushed stone, tested in the Los Angeles Abrasion Tests, shall not be greater than 45 percent.

(3) Crushed stone shall be stockpiled and placed in such a manner that foreign material will not be included in the complete embedment section.

CONSTRUCTION METHODS

Bedding under storm drain inlets will be constructed at the proposed thickness below bottom of proposed inlet. The width of bedding shall extend no more than 18 inches outside of proposed inlet dimensions. The Contractor will not be paid for placed extra bedding that is excessive in width and/or exceeds the limits shown in the plans.

Additional excavation will be required in soft, mucky areas where the specified bedding will not adequately support the proposed storm drain inlets (or pipes). Where such areas as determined by the Engineer are excavated, the additional depth shall be backfilled with additional Class 7 stone or material approved by the City Engineer. The Contractor will not be paid for any additional excavation required, but will be paid for the additional backfill material required. No additional compensation will be given to the Contractor unless the Engineer has measured and verified the additional excavation prior to the placement of the bedding.

MEASUREMENT AND PAYMENT

Inlet structure bedding including all work associated with furnishing the material, hauling, excavating, placing, spreading, and compacting; and all equipment, tools, labor and incidentals necessary to complete the work shall not be measured for separate payment but shall be subsidiary to the pay items associated with construction of inlet structures.

END OF SECTION

STRUCTURAL CONCRETE

DESCRIPTION

This section covers concrete and reinforcing steel for the construction of drainage structures conforming to the lines, grades, dimensions, and details shown on the Plans or as directed by the Engineer.

Additional requirements are as specified in the sections of the specifications covering the several items involved with concrete and reinforcing steel.

STANDARD SPECIFICATIONS

Concrete and reinforcing steel construction shall be accomplished in accordance with the applicable portions of SECTION 802 – CONCRETE FOR STRUCTURES and SECTION 804 – REINFORCING STEEL FOR STRUCTURES of the Standard Specifications, except as modified or augmented herein.

MEASUREMENT AND PAYMENT

Concrete and reinforcing steel will not be measured for separate payment but will be considered subsidiary to pay items addressed in the specification DROP INLETS AND JUNCTIONS BOXES.

END OF SECTION

TRENCH AND EXCAVATION SAFETY SYSTEMS

DESCRIPTION

This item covers the compliance with Act 291 of 1993 which requires the inclusion, in the bid, of a separate pay item for "TRENCH AND EXCAVATION SAFETY SYSTEMS."

STANDARDS

All work under this item shall conform to the current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P.

"Competent Person" as defined in the Standard Specifications shall be the General Contractor's General Superintendent.

CONSTRUCTION METHODS

NOTIFICATIONS REQUIRED: The Contractor, prior to beginning any excavation, shall notify the State Department of Labor (Safety Division) that work is commencing on a project with excavations greater than five feet.

The Contractor shall notify all Utility Companies and Owners in accordance with OSHA Administration 29 CFR 1926.651(b)(2) for the purpose of locating utilities and underground installations.

EXISTING STRUCTURES AND UTILITIES: Where the trench or excavation endangers the stability of a building, wall, street, highway, utilities, or other installation, the Contractor shall provide support systems such as shoring, bracing, or underpinning to ensure the stability of such structure or utility.

The Contractor may elect to remove and replace or relocate such structures or utilities with the written approval of the owner of the structure or utility and the Project Owner.

METHOD OF MEASUREMENT

Trench or excavation safety systems shall be measured as a complete unit.

BASIS OF PAYMENT

Trench and excavation safety systems shall be paid for at the lump sum price bid for "TRENCH AND EXCAVATION SAFETY SYSTEM," which price shall be full compensation for benching, sloping, sheeting, shoring, shielding, or any other protective system that provides the necessary protection to comply with Act 291 of 1993.

Payment will be made under:

Trench and Excavation Safety System - per lump sum

END OF SECTION

TOPSOIL

DESCRIPTION

This section covers the furnishing and placing of topsoil within construction limits of filled ditch surface and other potentially disturbed vegetative areas implied on the Plans or as directed by the Engineer.

STANDARDS

Materials and work shall be in accordance with SECTION 628 – TOPSOIL FURNISHED AND PLACED of the Standard Specifications, except as modified or augmented herein.

CONSTRUCTION METHODS

Immediately following the topsoiling operations, all gutters, sidewalks, driveways, street pavement, yards or other areas shall be cleaned of all excess topsoil.

MEASUREMENT AND PAYMENT

Topsoil shall be paid for at the contract unit price per cubic yard for "TOPSOIL," which price shall be full compensation for all hauling, placement, grading, and compaction of material; and for all equipment, tools, labor and incidentals necessary to complete the work.

Payment will be made under:

Topsoil – per cubic yard

END OF SECTION

SOLID SODDING

DESCRIPTION

This section covers the furnishing and placing of approved sod, fertilizer, and water to form solid mats within construction limits of filled ditch surface and other potentially disturbed vegetated areas implied on the Plans or as directed by the Engineer.

STANDARDS

Materials and work shall be in accordance with SECTION 624 – SOLID SODDING of the Standard Specifications, except as herein modified or augmented.

CONSTRUCTION METHODS

Areas to be sodded shall be shaped to allow for placement of sod that shall match adjacent residential grades and provide positive drainage acceptable to the engineer.

Immediately following the sodding operations, all gutters, sidewalks, driveways, street pavement, yards, or other areas shall be cleaned of all debris, excess sod, topsoil, or other objectionable matter. All such clean-up operations shall be completed before sodded areas are measured for payment as described below.

METHOD OF MEASUREMENT

Areas covered by living sod completed and accepted will be measured by the square yard to the nearest square yard.

BASIS OF PAYMENT

Solid sodding acceptably completed, and measured as provided above, will be paid for at the contract unit price per square yard bid for "SODDING," which price shall be full compensation for furnishing and placing all materials, including sod, fertilizer, and water; for clean-up work; and for all equipment, tools, labor and incidentals necessary to complete the work.

Payment will be made under:

Sodding - per square yard

END OF SECTION

MAINTENANCE OF TRAFFIC

DESCRIPTION

This item shall include the erection of signs, barricades, temporary markings, and the maintenance of, or noninterference with, traffic in accordance with details shown on the Plans and with these Specifications, or as directed by the Engineer.

STANDARDS

Maintenance of traffic as described above shall be accomplished in accordance with the applicable portions of SECTION 603 – MAINTENANCE OF TRAFFIC AND TEMPORARY STRUCTURES of the ARDOT Standard Specifications, except as modified or augmented herein.

Traffic control devices shall be in accordance with SECTON 604 – TRAFFIC CONTROL DEVICES IN CONSTRUCTION ZONES of the ARDOT Standard Specifications, except as modified or augmented herein.

CONSTRUCTION METHODS

The Contractor shall implement and maintain all maintenance of traffic devices by submitting his/her own Plan to NLR Traffic Services Department for review and approval. The Contractor shall initiate and maintain all necessary labor and materials necessary to construct the project in a manner which will guarantee public safety with a minimum of inconvenience. Additional work shall be performed by the Contractor during construction as directed by NLR Traffic Services Department if necessary to insure the above standards.

CONTRACTOR PERSONNEL: The Contractor shall designate a traffic control supervisor to furnish continuous surveillance over traffic control operations. This supervisor shall be available at night and weekends to respond to calls involving traffic control. The name of the traffic control supervisor shall be provided at the preconstruction conference and to local police.

The Contractor's personnel who are used to maintain traffic flow, such as flagmen or any other person who verbally communicates with or gives directions to the motorized public, shall speak English fluently.

DRIVEWAYS: Maintenance of driveway accessibility shall be as approved by NLR Traffic Services Department. It shall be the Contractor's responsibility to maintain adequate access to private property at all times. The intent of this section of the Specifications is to cause as little inconvenience as possible to private property owners.

SUSPENSION OF WORK: If the Engineer or NLR Traffic Services Department determines that provisions for safe traffic control are not being provided or maintained, the work will be suspended. In cases of serious or willful disregard for safety of the public or construction workers, the Engineer or NLR Traffic Services Department will place the traffic control devices in proper condition and deduct the costs from monies due the Contractor.

METHOD OF MEASUREMENT

Maintenance of Traffic will be measured as a complete item.

BASIS OF PAYMENT

Work performed under this section, acceptably completed as provided above, will be paid for at the control lump sum bid price for "MAINTENANCE OF TRAFFIC," which price shall be full compensation for this item. Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer.

Payment will be made under:

Maintenance of Traffic – per Lump Sum

END OF SECTION

LOUISE STREET
DRAINAGE IMPROVEMENTS

NORTH LITTLE ROCK, AR

APRIL 2024

INDEX OF SHEETS	
SHEET	TITLE
1	COVER SHEET
2	DEMOLITION PLAN
3	SITE PLAN
4	DETAILS 1
5	DETAILS 2

CITY OF NORTH LITTLE ROCK
Engineering Department
500 WEST 13TH STREET
NORTH LITTLE ROCK, AR 72114

LOUISE STREET
DRAINAGE IMPROVEMENTS

COVER SHEET

DATE: 04/2024
DESIGNED BY: MCK
DRAWN BY: MCK
SCALE: NONE

SHEET NUMBER
1

GENERAL SITE CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL THOROUGHLY VISIT THE SITE AND REVIEW THE PLANS AND SPECIFICATIONS BEFORE CONSTRUCTION.
2. THE CONTRACTOR SHALL CALL "ONE-CALL" FOR LOCATION OF ALL UTILITIES PRIOR TO COMMENCEMENT OF ANY EXCAVATION.
3. ANY DAMAGE TO UTILITY LINES OR PROPERTIES CAUSED BY THE CONTRACTOR SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR SHALL VERIFY THE HORIZONTAL AND VERTICAL ALIGNMENT OF EXISTING AND PROPOSED STORM SEWER TO ENSURE THEY ARE INSTALLED WITH ADEQUATE COVER.
5. THE CONTRACTOR SHALL CONTROL EROSION OF THE SITE.
6. ANY EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE AT CONTRACTOR'S EXPENSE.

Clear and Shape Ditch in Preparation for Pipe Installation

Louise St.

Sawcut, Remove and Dispose of Existing Curb and Gutter and Headwall Wings in Preparation for Curb Inlet Construction

CITY OF NORTH LITTLE ROCK
Engineering Department
500 WEST 13TH STREET NORTH LITTLE ROCK, AR 72114

LOUISE STREET
DRAINAGE IMPROVEMENTS

DEMOLITION PLAN

DATE:	04/2024
DESIGNED BY:	MCK
DRAWN BY:	MCK
SCALE:	1" = 40'

SHEET NUMBER
2

GENERAL SITE CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL THOROUGHLY VISIT THE SITE AND REVIEW THE PLANS AND SPECIFICATIONS BEFORE CONSTRUCTION.
2. THE CONTRACTOR SHALL CALL "ONE-CALL" FOR LOCATION OF ALL UTILITIES PRIOR TO COMMENCEMENT OF ANY EXCAVATION.
3. ANY DAMAGE TO UTILITY LINES OR PROPERTIES CAUSED BY THE CONTRACTOR SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
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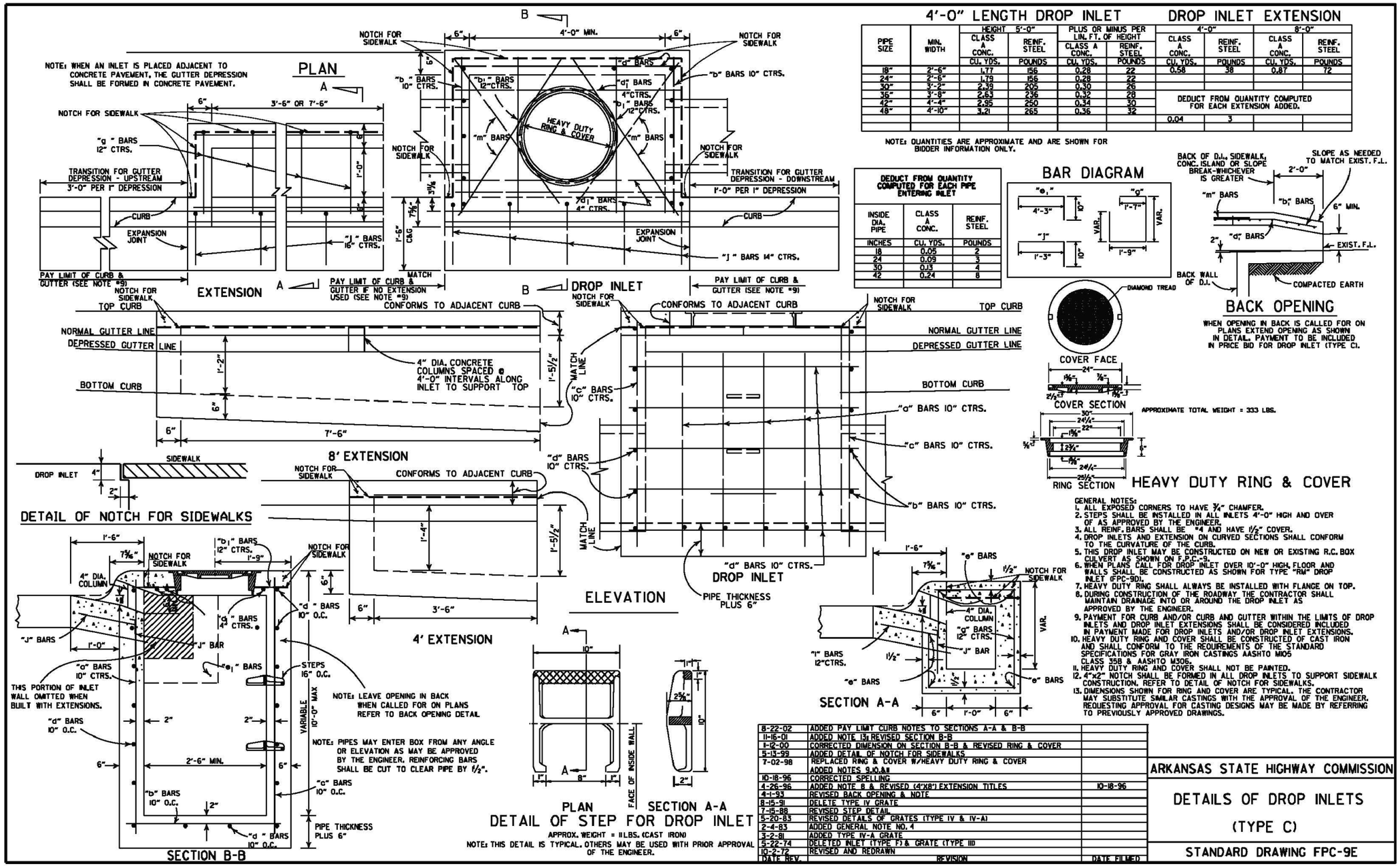
CITY OF NORTH LITTLE ROCK
Engineering Department
500 WEST 13TH STREET
NORTH LITTLE ROCK, AR 72114

LOUISE STREET
DRAINAGE IMPROVEMENTS

SITE
PLAN

DATE:	04/2024
DESIGNED BY:	MCK
DRAWN BY:	MCK
SCALE:	1" = 40'

SHEET NUMBER
3



4'-0" LENGTH DROP INLET

PIPE SIZE	MIN. WIDTH	HEIGHT 5'-0" CLASS A CONC. CU. YDS.	HEIGHT 5'-0" REINF. STEEL POUNDS	PLUS OR MINUS PER LIN. FT. OF HEIGHT CLASS A CONC. CU. YDS.	PLUS OR MINUS PER LIN. FT. OF HEIGHT REINF. STEEL POUNDS
18"	2'-6"	1.77	156	0.28	22
24"	2'-6"	1.79	156	0.28	22
30"	3'-2"	2.39	205	0.30	26
36"	3'-8"	2.63	236	0.32	28
42"	4'-4"	2.95	250	0.34	30
48"	4'-10"	3.21	265	0.36	32

NOTE: QUANTITIES ARE APPROXIMATE AND ARE SHOWN FOR BIDDER INFORMATION ONLY.

DROP INLET EXTENSION

4'-0" CLASS A CONC. CU. YDS.	4'-0" REINF. STEEL POUNDS	8'-0" CLASS A CONC. CU. YDS.	8'-0" REINF. STEEL POUNDS
0.58	38	0.87	72

DEDUCT FROM QUANTITY COMPUTED FOR EACH EXTENSION ADDED.

0.04	3		

DEDUCT FROM QUANTITY COMPUTED FOR EACH PIPE ENTERING INLET

INSIDE DIA. PIPE	CLASS A CONC.	REINF. STEEL
INCHES	CU. YDS.	POUNDS
18	0.05	2
24	0.09	3
30	0.13	4
42	0.24	6

BAR DIAMETER

BACK OPENING

WHEN OPENING IN BACK IS CALLED FOR ON PLANS EXTEND OPENING AS SHOWN IN DETAIL. PAYMENT TO BE INCLUDED IN PRICE BID FOR DROP INLET (TYPE C).

APPROXIMATE TOTAL WEIGHT = 333 LBS.

HEAVY DUTY RING & COVER

SECTION A-A

GENERAL NOTES:
1. ALL EXPOSED CORNERS TO HAVE ¾" CHAMFER.
2. STEPS SHALL BE INSTALLED IN ALL INLETS 4'-0" HIGH AND OVER OF AS APPROVED BY THE ENGINEER.
3. ALL REINF. BARS SHALL BE #4 AND HAVE 1½" COVER.
4. DROP INLETS AND EXTENSION ON CURVED SECTIONS SHALL CONFORM TO THE CURVATURE OF THE CURB.
5. THIS DROP INLET MAY BE CONSTRUCTED ON NEW OR EXISTING R.C. BOX CULVERT AS SHOWN ON F.P.C.-9.
6. WHEN PLANS CALL FOR DROP INLET OVER 10'-0" HIGH, FLOOR AND WALLS SHALL BE CONSTRUCTED AS SHOWN FOR TYPE "RM" DROP INLET (FPC-9D).
7. HEAVY DUTY RING SHALL ALWAYS BE INSTALLED WITH FLANGE ON TOP.
8. DURING CONSTRUCTION OF THE ROADWAY THE CONTRACTOR SHALL MAINTAIN DRAINAGE INTO OR AROUND THE DROP INLET AS APPROVED BY THE ENGINEER.
9. PAYMENT FOR CURB AND/OR CURB AND GUTTER WITHIN THE LIMITS OF DROP INLETS AND DROP INLET EXTENSIONS SHALL BE CONSIDERED INCLUDED IN PAYMENT MADE FOR DROP INLETS AND/OR DROP INLET EXTENSIONS.
10. HEAVY DUTY RING AND COVER SHALL BE CONSTRUCTED OF CAST IRON AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR GRAY IRON CASTINGS AASHTO M105 CLASS 35B & AASHTO M306.
11. HEAVY DUTY RING AND COVER SHALL NOT BE PAINTED.
12. 4"x2" NOTCH SHALL BE FORMED IN ALL DROP INLETS TO SUPPORT SIDEWALK CONSTRUCTION. REFER TO DETAIL OF NOTCH FOR SIDEWALKS.
13. DIMENSIONS SHOWN FOR RING AND COVER ARE TYPICAL. THE CONTRACTOR MAY SUBSTITUTE SIMILAR CASTINGS WITH THE APPROVAL OF THE ENGINEER. REQUESTING APPROVAL FOR CASTING DESIGNS MAY BE MADE BY REFERRING TO PREVIOUSLY APPROVED DRAWINGS.

DATE REV.	REVISION	DATE FILMED
8-22-02	ADDED PAY LIMIT CURB NOTES TO SECTIONS A-A & B-B	
11-16-01	ADDED NOTE 13; REVISED SECTION B-B	
1-12-00	CORRECTED DIMENSION ON SECTION B-B & REVISED RING & COVER	
5-13-99	ADDED DETAIL OF NOTCH FOR SIDEWALKS	
7-02-98	REPLACED RING & COVER W/HEAVY DUTY RING & COVER ADDED NOTES 9,10,&11	
10-18-96	CORRECTED SPELLING	
4-26-96	ADDED NOTE 8 & REVISED (4'X8') EXTENSION TITLES	10-18-96
4-1-93	REVISED BACK OPENING & NOTE	
8-15-91	DELETE TYPE IV GRATE	
7-15-88	REVISED STEP DETAIL	
5-20-83	REVISED DETAILS OF GRATES (TYPE IV & IV-A)	
2-4-83	ADDED GENERAL NOTE NO. 4	
3-2-81	ADDED TYPE IV-A GRATE	
5-22-74	DELETED INLET (TYPE F) & GRATE (TYPE III)	
10-2-72	REVISED AND REDRAWN	

ARKANSAS STATE HIGHWAY COMMISSION

DETAILS OF DROP INLETS (TYPE C)

STANDARD DRAWING FPC-9E

CITY OF NORTH LITTLE ROCK
Engineering Department
500 WEST 13TH STREET
NORTH LITTLE ROCK, AR 72114

LOUISE STREET
DRAINAGE IMPROVEMENTS

DETAILS 1

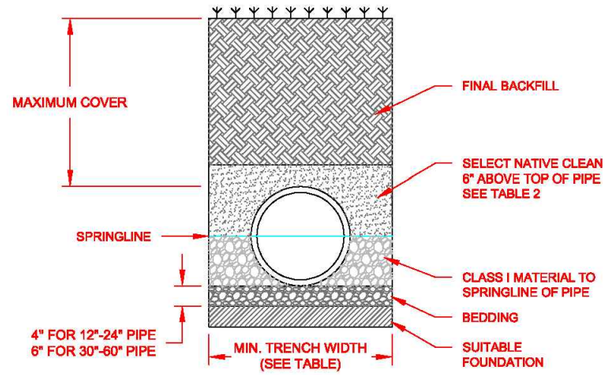
DATE: 04/2024
DESIGNED BY: MCK
DRAWN BY: MCK
SCALE: NONE

SHEET NUMBER
4

HP STORM TRENCH INSTALLATION DETAIL (ALTERNATE)

TABLE 1, RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	30" (762mm)
15" (375mm)	34" (864mm)
18" (450mm)	39" (991mm)
24" (600mm)	48" (1219mm)
30" (750mm)	56" (1422mm)
36" (900mm)	64" (1626mm)
42" (1050mm)	72" (1829mm)
48" (1200mm)	80" (2032mm)
60" (1500mm)	96" (2438mm)



NOTES:

1. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
2. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321. CLASS IVB MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 4"-24" (100mm-600mm); 6" (150mm) FOR 30"-60" (750mm-1500mm).
5. BACKFILL: FOR PIPES OUTSIDE OF PAVEMENT CLASS I MATERIAL TO BE USED FOR BACKFILL UP TO THE SPRINGLINE OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER. CLASS I MATERIAL MUST BE COMPACTED IN 6" (200mm) LIFTS.
6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS IS 12" (300mm) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTATION.
7. SELECT NATIVE CLEAN BACKFILL SHALL BE WELL PLACED, MODERATELY COMPACTED (85% SPD) CLASS IV OR BETTER PER ASTM D2321 WITH NO FOREIGN DEBRIS INCLUDING ROCKS, LARGE CLUMPS ORGANIC MATERIAL, OR FROZEN MATERIAL.
8. HP STORM ALTERNATE TRENCH DETAIL ONLY APPLIES TO BACKFILL INSTALLATIONS IN NON-TRAFFIC APPLICATIONS PER TN 2.04A. ALTERNATE TRENCH USE MUST BE APPROVED BY DESIGN ENGINEER. DETAIL DOES NOT SUPERSEDE ADS STANDARD DETAIL STD-108.

TABLE 2, MAXIMUM COVER FOR ADS HP STORM PIPE, ALTERNATE INSTALLATION, ft (γ_s=120)

	SELECT NATIVE CLEAN MATERIAL CLASSIFICATION		
PIPE DIAM.	CLASS II	CLASS III	CLASS IV
12" (300mm)	17 (5.2m)	14 (4.3m)	11 (3.4m)
15" (375mm)	17 (5.2m)	14 (4.3m)	10 (3.0m)
18" (450mm)	16 (4.9m)	13 (4.0m)	10 (3.0m)
24" (600mm)	14 (4.3m)	12 (3.7m)	9 (2.7m)
30" (750mm)	13 (4.0m)	12 (3.7m)	8 (2.4m)
36" (900mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
42" (1050mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
48" (1200mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)
60" (1500mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)

FILL HEIGHT TABLE GENERATED ASSUMING DRY CONDITIONS, OUTSIDE OF WATER TABLE. FOR INSTALLATION WITHIN THE WATER TABLE, CONTACT APPLICATIONS ENGINEERING.

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D
7	REV. DRAWING NAME OR NUMBER	TJR	01/28/15	

TRENCH INSTALLATION
ALTERNATE DETAIL (HP STORM)

DRAWING NUMBER: STD-101E

ADS Advanced Drainage Systems, Inc.
4640 TRUEMAN BLVD
HILLIARD, OHIO 43026

DRAWN BY: JAB
DATED: 01/29/09
CHK'D BY:
APPROVED:
SCALE: NTS
SHEET: 1 OF 1

NORTH LITTLE ROCK

CITY OF NORTH LITTLE ROCK
Engineering Department
500 WEST 13TH STREET
NORTH LITTLE ROCK, AR 72114

LOUISE STREET
DRAINAGE IMPROVEMENTS

DETAILS 2

DATE: 04/2024
DESIGNED BY: MCK
DRAWN BY: MCK
SCALE: NONE

SHEET NUMBER
5