PROJECT MANUAL

STONE LINKS SUBDIVISION
MULTI-PIPE MAINTENANCE
REHABILITATIONS

MAY 2021

NLR CITY ENGINEERING
PROJECT NO. 21-08

Prepared By:
NLR City Engineering
500 W. 13th Street
North Little Rock, Arkansas 72114

STONE LINKS SUBDIVISION
MULTI-PIPE MAINTENANCE REHABILITATIONS

City Engineering Project No. 21-08

PROJECT MANUAL

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CITY OF NORTH LITTLE ROCK, ARKANSAS
COMMERCE DEPARTMENT
Mary Beth Bowman, Director
Amy Smith, Assistant Director for Procurement
Crystal Willis, Admin. Sect./Assistant Purchasing Agent

120 MAIN STREET, 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: 21-3703 Date Issued: Wednesday, May 5, 2021

Date & Time Bid Opening: Tuesday, May 18, 2021 @ 10:00am.

Stone Links Subdivision – Multi-Pipe Maintenance Rehabilitations

Total Project Bid Price: $_____

Plans and specifications may be obtained from:

- Commerce Department at 120 Main Street, North Little Rock, AR 72114
- www.nlr.ar.gov click on the tab "Business," select "Bids and Vendors" and then choose "Current Bids."
- Please direct all technical questions in writing to Chris Wilbourn at cwilbourn@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: _____

PLEASE PUBLISH THE FOLLOWING LEGAL NOTICE TWO TIMES ON:

Wednesday, May 5, 2021
AND
Sunday, May 9, 2021

Notice to bidders
Bid #21-3703

Notice is hereby given that the City of North Little Rock's Commerce Department will receive sealed proposals until **Tuesday, May 18, 2021 at 10:00am** on the following:

Stone Links Multi-Pipe Maintenance Rehabilitation

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1. NOTICE TO THE GENERAL CONTRACTORS

Sealed bids for the **STONE LINKS MULTI-PIPE MAINTENANCE REHABILITATION** will be received by the City of North Little Rock, at **10:00 am on Tuesday, May 18, 2021** at 120 Main Street, North Little Rock, Arkansas and then be publicly opened and read aloud. Any bids not submitted on time will be returned unopened.

2. SCOPE OF WORK

The Contractor shall complete all work as specified or indicated in the Contract Documents. The work is generally described as follows:

a. Removal and Replacement of 18" and 36" Diameter Plastic Pipe as designated in the Contract Documents.
b. Plastic Pipe Point Repairs as Identified by NLR City Engineering.
c. Concrete Collar for Plastic Pipe Connections to Existing Inlets.
d. Removal and Replacement of impacted Privacy Fencing.
e. Topsoil and Solid Sod.

Work includes all labor, materials, equipment, supplies, and incidental items necessary to complete the project in conformance with the plans and specifications as more fully set forth in the Contract Documents attached hereto and incorporated herein as Exhibit "A" (the "Project").

3. SINGLE PROPOSAL

Bidders shall submit one proposal for the entire project.

4. BID SUBMISSION

Bids shall be submitted on the form within the project manual and shall be delivered in a clearly identified, sealed, opaque envelope prior to the date and time described above.

5. AVAILABILITY OF CONSTRUCTION DOCUMENTS

Bona fide bidders may obtain documents at the address listed below, on the following basis:

a. Drawings and Specifications may be examined at the following places:

COMMERCE DEPARTMENT
120 Main Street
North Little Rock, AR 72114
(501) 975-8881
Fax 975-8885

b. www.nlr.ar.gov click on the tab "Business," select "Bids and Vendors" and then choose "Current Bids."

6. BID SECURITY

Proposals shall be accompanied by a cashier's or certified check upon a national or state bank in an amount not less than five percent (5% of the total maximum bid price) payable without recourse to the Owner, or a bid bond in the same amount from a reliable surety company, as a guarantee that the Bidder will enter into a contract and execute performance and payment bonds within fifteen (15) days after notice of award of Contract to him. Such bid guarantee shall be made payable to the CITY OF NORTH LITTLE ROCK.

The **SUCCESSFUL** bidder will be required to furnish a performance and payment bond upon the form provided in the amount of one hundred percent (100%) of the contract price from an approved surety company holding a permit from the State of Arkansas to act as surety, or other surety or sureties acceptable to the Owner.

7. WITHDRAWAL OF BIDS

No bid may be withdrawn for a period of sixty (60) days subsequent to date of the opening of Proposals.

8. COMPLIANCE WITH ARKANSAS STATUTES

All bidders shall comply with the requirements of the Contractor's Licensing Law of the State of Arkansas, and all applicable Arkansas regulations. All bonds on this project shall comply with Arkansas Statutory Performance and Payment Bond Law, Act 351 of 1953, as amended by Act 209 of 1957.

9. REJECTION OF BIDS

The Owner reserves the right to reject any or all bids, in whole or in part, or award items separately; to waive any informalities or irregularities in the bids and bidding deemed to be in the best interests of the City of North Little Rock; and to reject nonconforming, nonresponsive, or conditional bids. Proposals which fail to comply fully with the provisions of the specifications and other Contract Documents may be deemed invalid and may not receive consideration.

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

CITY OF NORTH LITTLE ROCK
COMMUNITY DEVELOPMENT AGENCY

Amy Smith
Assistant Director for Procurement
****

Purchase Order **No.XXXXXXX**

Send invoice and proof of publication to:

Amy Smith
Commerce Department
P.O. Box 5757
North Little Rock, AR 72119

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. The City reserves the right to reject any and all bids.

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 $20,000.00 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 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.

24. Additional information or bid forms may be obtained from:
COMMERCE DEPARTMENT, 120 Main 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:

Mary Beth Bowman
Director of Commerce
120 Main Street (P.O. Box 5757)
North Little Rock, AR 72119

BID FORM

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

To. _____

Address: _____

_____

_____

Project Title: **STONE LINKS SUBDIVISION**
MULTI-PIPE MAINTENANCE REHABILITATIONS

Engineer's Project No.: **CNLR ENGINEERING PROJECT NO. 21-08**

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.)

CONSTRUCTION DAYS

The Work will be completed and ready for final payment in accordance with the General Conditions within **75 Calendar Days** after the date when the Contract Time commences to run as provided in Notice to Proceed.

LIQUIDATED DAMAGES

Liquidated Damages: Owner and Contractor recognize that time is of the essence of this Agreement and the Owner will suffer financial loss if the Work is not completed within the time specified in above, plus any extensions thereof allowed in accordance with the General Conditions. They also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner **Two Hundred and Fifty Dollars ($250.00)** for each day that expires after the time specified in Paragraph 3 for completion and readiness for final payment.

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	Survey/Grade Control Coordination with City Engineering of Impacted Existing Curb Inlets and Flared End Section.	LS	1	$	$
3	Trench and Excavation Safety Systems	LS	1	$	$
4	Removal & Replacement of Privacy Fencing.	LF	425	$	$
5	Unclassified Excavation.	CY	1,400	$	$
6	Filter Fabric Non-Woven Marifi 140N or Approved Equal.	SY	275	$	$
7	Filter Fabric Non-Woven Marifi 180N or Approved Equal.	SY	1,100	$	$
8	No. 57 Stone or Approved Equal.	TON	730	$	$
9	Removal of existing 18” Dia. Plastic Pipe & Replacement with 18” Dia. ADS HP Storm Pipe.	LF	165	$	$
10	Removal of existing 36” Dia. Plastic Pipe & Replacement with 36” Dia. ADS HP Storm Pipe (Trench Box Required).	LF	375	$	$

Item No.	Item Description	Units	Quantity	Unit Cost	Total Cost
11	ADS Mar-Mac 18” HDPE Double Repair Coupling	EA	1	$	$
12	ADS Mar-Mac 36” HDPE Double Repair Coupling	EA	6	$	$
13	ADS - 18” Flared End Section	EA	1	$	$
14	Connection of New 18” Dia. Plastic Pipe to existing Concrete Inlet (Concrete or Flowable fill Collar Required).	EA	1	$	$
15	Connection of New 36” Dia. Plastic Pipe to existing Concrete Inlet (Concrete or Flowable fill Collar Required).	EA	1	$	$
16	Topsoil	CY	65	$	$
17	Solid Sod	SY	500	$	$
18	Allowance for Residential Irrigation Replacement Impacted by Construction	LS	SET	$2,500	$2,500

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 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:

STONE LINKS SUBDIVISION – MULTI-PIPE MAINTENANCE REHABILITATIONS
City Engineering Project No. 21-08
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

NOTICE OF AWARD

TO:

PROJECT: STONE LINKS SUBDIVISION – MULTI-PIPE MAINTENANCE REHABILITATIONS – City Project No. 21-08

The OWNER has considered the BID submitted by you on _____ for the above described WORK in response to its Advertisement for Bids and Instructions to Bidders.

You are hereby notified that your BID has been accepted in the amount of:

_____ Dollars ($_____)

You are required by the Instructions to Bidders to execute the Contract and furnish the required CONTRACTOR'S Performance BOND, Payment BOND, and certificates of insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Contract and to furnish said BONDS within fifteen (15) days from the date of this Notice, said OWNER will be entitled to consider your bid in default, to annul this Notice of Award and to declare your Bid Security forfeited. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this_____ day of _____, 20___.

Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

by_____,

this the_____ day of _____, 20

By _____

Title _____

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:
Amount:
Description (*Name and Location*):

BOND

Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ (Seal)	_____ (Seal)
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
_____	_____
Title	Title

Note: Provide execution by additional parties, such as joint ventures, if necessary.

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.

2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
   2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
   2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
   2.3 Owner has agreed to pay the Balance of the Contract Price to:
      1. Surety in accordance with the terms of the Contract; or
      2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.

3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:

   3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
   3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
   3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
   3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
      1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
      2. Deny liability in whole or in part and notify Owner citing reasons therefor.

4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

11. Definitions.

11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – (*Name, Address and Telephone*) Surety Agency or Broker: Owner's Representative (*Engineer or other party*):

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

   5.1 Claimants who do not have a direct contract with the Contractor,

      5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or

(2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

CONTRACT

FOR

STONE LINKS SUBDIVISION
MULTI-PIPE MAINTENANCE REHABILITATIONS

THIS CONTRACT, by and between the City of North Little Rock ("City"), acting herein through its Mayor, Terry C. Hartwick, and _____("Contractor"), is effective on the date signed by the City (the "Effective Date").

In consideration of the mutual covenants herein, the parties agree as follows:

ARTICLE 1. SCOPE OF WORK

1.1 Work

A. The Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work generally is described as follows:

This Historical Old Mill Stone Waterfall partially collapsed in 2020. This project involves the rehabilitation of the existing structure. Items of work include:

a. Removal and replacement of 18" and 36" diameter plastic pipe as designated in the Contract Documents.
b. Plastic pipe point repairs as identified by NLR City Engineering.
c. Concrete collar for plastic pipe connections to existing inlets.
d. Removal and replacement of impacted privacy fencing.
e. Topsoil and solid sod.

Work includes all labor, materials, equipment, supplies, and incidental items necessary to complete the project in conformance with the plans and specifications as more fully set forth in the Contract Documents attached hereto and incorporated herein as Exhibit "A" (the "Project").

B. All Contract Documents, including plans and specifications, are included in the Project Manual, which is incorporated herein by reference as Exhibit "A" or as though fully set forth herein.

C. The Work includes but is not limited to, all labor, materials, equipment, supplies, and incidental items necessary to complete the Project in conformance with the plans and specifications as more fully set forth in the Contract Documents (the "Project"). The Work may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

ARTICLE 2. CONTRACT DOCUMENTS

2.1 Intent of Contract Documents

A. It is the intent of the Contract Documents to describe a functionally complete project. The Contract Documents do not indicate or describe all of the Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the City and Engineer. This Contract supersedes prior negotiations, representations, and agreements, whether written or oral. The Contract Documents are complementary; what is required by one part of the Contract Documents is as binding as if required by other parts of the Contract Documents.

B. During the performance of the Work and until final payment, Contractor and City shall submit all matters in question concerning the requirements of the Contract Documents, or relating to the acceptability of the Work under the Contract Documents to the Engineer. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

C. Engineer will render a written clarification, interpretation, or decision on the issue submitted, or initiate a modification to the Contract Documents.

D. Contractor, and its subcontractors and suppliers, shall not have or acquire any title to or ownership rights to any of the Drawings, Specifications, or other documents (including copies or electronic media editions) prepared by Engineer or its consultants.

2.2 Contract Documents Defined

A. The Contract Documents shall consist of the following documents:

.1 The fully executed Contract; which incorporates by reference documents (.2) thru (.10).
.2 The Invitation to Bid, *sans* the bidding requirements dated: _____
.3 The Contractor's Bid dated: _____, including any attachments
.4 Project Manual, which contains General Requirements, and applicable Drawings and Specifications (Exhibit A);

.5 Performance, Maintenance and Payment Bond;
.6 Certificate of Insurance Coverage

The following, which may be delivered or issued on or after the Effective Date of the Contract and are, not attached hereto:

.7 Written Amendments;
.8 Work Change Directives;
.9 Change Order(s); and
.10 Notice to Proceed.

To the extent of any direct conflict between any of the Contract Documents, the Contractor shall immediately seek clarification from the Engineer. In the event that the Engineer fails promptly to

clarify such discrepancy, the Contractor shall proceed with the Work and give precedence to the Contract Documents in the following order of priority:

.1 Modifications issued after execution of this Agreement;
.2 This Agreement, as modified;
.3 Addenda issued prior to the execution of the Agreement, with the Addenda bearing the latest date taking precedence;
.4 Any Supplementary Conditions, if applicable;
.5 The General Conditions of the Contract for Construction, as modified;
.6 The Drawings and Specifications; and
.7 Other documents specifically enumerated in the Agreement as part of the Contract Documents.

2.3 The Contract Documents may only be amended, modified, or supplemented by a Change Order, a Work Change Directive or a Field Order. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation.

ARTICLE 3 ENGINEER

3.1 The Project will be coordinated by:

City of North Little Rock Engineering Department

Chris Wilbourn, P.E. (Chief City Engineer)

Who is hereinafter called ENGINEER, and who is to act as City's representative, assumes

all duties and responsibilities, and has the rights and authority assigned to ENGINEER in the Contract Documents.

ARTICLE 4 CONTRACT TIMES, DATES FOR SUBSTANTIAL COMPLETION, AND LIQUIDATED DAMAGES

4.1 Contract Times

Contractor hereby agrees to commence the work on the Project on or before a date to be specified in a written Notice to Proceed (NTP) from the City, incorporated by reference as set forth herein, and to complete fully the Project within **75 CALENDAR days** or as determined in writing by City Engineer.

4.2 Liquidated Damages

A. Contractor and City recognize that time is of the essence in the performance of the Contract, and that City will incur damages if Contractor does not complete the Work according to the requirements of Paragraph 4.01. Because such damages for delay would be difficult and costly to determine, City and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay City **$250.00** for each day that expires after the Contract Time for substantial completion.

4.3 Delays in Contractor's Progress

A. If City, Engineer, or anyone for whom City is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractors entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor or their subcontractors or suppliers.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of City, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times.

D. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor or Contractor's subcontractors or suppliers.

4.4 Progress Schedules

A. Contractor shall develop a progress schedule and submit to the Engineer for review and comment before starting Work on the Site. The Contractor shall modify the schedule in accordance with the comments provided by the Engineer.

B. The Contractor shall update and submit the progress schedule to the Engineer each month. The City may withhold payment if the Contractor fails to submit the schedule.

ARTICLE 5 CONTRACT PRICE

5.1 Payment

A. Contractor hereby agrees to commence and complete the Work for the sum of _____Dollars ($_____) for all services associated with the Work as shown on the Plans under the terms stated in the Contract Documents (Project Manual). All invoices submitted to City by Contractor shall list in detail the services provided.

B. Further, in accordance with the Contract Documents, Contractor agrees, at its own proper cost and expense, to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the Project in accordance with the Bid Documents and General Requirements and prices stated in these specifications, which include any maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, all of which are made a part hereof and collectively constitute the Contract.

5.2 Payment Procedure

The basis for progress payments will be incorporated into a form of Application for Payment acceptable to Engineer. ENGINEER will process Applications for Payment. Progress payments for Unit Price Work will be paid for monthly for each unit of Work completed during that pay period.

Payment will be made in an amount equal to the total of all extended prices for actual Work completed. The extended price is determined by multiplying the unit price times the actual quantity of that Work item completed. The Engineer will determine actual quantities installed.

The City agrees to pay the Contractor in current funds for the Work performed under the Contract, subject to additions and deductions, within thirty (30) days of receipt of an Application for Payment approved by Engineer.

ARTICLE 6 INSURANCE AND BOND

6.1 Insurance

A. Before starting Work, Contractor shall, at Contractor's sole cost and expense, procure and maintain for the duration of this Contract proper and complete liability insurance in amounts not less than the following:

General Liability	$1,000,000
Workers' Compensation	Statutory
Employer's Liability	
Bodily Injury, each Accident	$1,000,000
Bodily Injury by Disease, each Employee	$1,000,000
Bodily Injury/Disease Aggregate	$1,000,000
.Commercial General Liability	
General Aggregate	$ 2,000,000
Products - Completed Operations Aggregate	$ 1,000,000
Personal and Advertising Injury	$ 1,000,000
Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000
Automobile Liability herein:	
Bodily Injury:	
Each Person	$ 1,000,000
Each Accident	$ 1,000,000
Property Damage:	
Each Accident	$ 1,000,000
Excess or Umbrella Liability:	
Per Occurrence	$ 1,000,000

General Aggregate	$ 2,000,000

Contractor's Pollution Liability:

Each Occurrence	$ 1,000,000
General Aggregate	$ 2,000,000

B. All insurance policies required to be purchased and maintained will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the insured and additional insured.

C. Automobile liability insurance provided by Contractor shall provide coverage against claims for damages because of bodily injury or death of any person or property damage arising out of the , maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

D. Contractor's commercial general liability policy shall be written on the most recent ISO commercial general liability occurrence form and include the following coverages and endorsements:

.1 Products and completed operations coverage maintained for three years after final payment;

.2 Blanket contractual liability coverage to the extent permitted by law;

.3 Broad form property damage coverage; and

.4 Severability of interest; underground, explosion, and collapse coverage; personal injury coverage.

E. The Contractor's commercial general liability and automobile liability, umbrella or excess, and pollution liability policies shall include and list City, Engineer, and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each as additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis.

.1 Additional insured endorsements will include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20

10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to City that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

.2 Contractor shall provide ISO Endorsement CG 20 32 07 04, "Additional Insured – Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent for design professional additional insureds.

F. Umbrella or excess liability insurance shall be written over the underlying employer's liability, commercial general liability, and automobile liability insurance. Subject to industry standard exclusions, the coverage afforded shall be procured on a "follow the form" basis as to each of the underlying policies. Contractor may demonstrate to City that Contractor has met the combined limits of insurance (underlying policy plus applicable umbrella) specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policies and an umbrella or excess liability policy.

G. The Contractor shall provide property insurance covering physical loss or damage during construction to structures, materials, fixtures, and equipment, including those materials, fixtures, or equipment in storage or transit.

H. If Contractor has failed to obtain and maintain required insurance, City may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise City's termination rights under Article 9.

6.2 Contractor shall provide a Performance and Payment Bond equaling the total amount of the bid, (pursuant to Ark. Code Ann. §§ 18-44-503 and 22-9-401. Additionally, if applicable, the Contractor shall provide a Maintenance Bond, equaling 50% of the Street Improvements within the Right-of-Way (ROW) for a period of two (2) years.

ARTICLE 7 CONTRACTOR'S RESPONSIBILITIES

7.1 Supervision and Superintendence

A. Contractor shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, safety, and procedures of construction.

B. Contractor shall assign a competent resident superintendent who is to be present at all times during the execution of the Work. This resident superintendent shall not be replaced without written notice to and approval by the City and Engineer except under extraordinary circumstances

C. Contractor at all times shall maintain good discipline and order at the Site.

7.2 Other Work at the Site

A. In addition to and apart from the Work of the Contractor, other work may occur at or adjacent to the Site. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of City, any other contractor, or any utility City performing other work at or adjacent to the Site.

7.3 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water , sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be new, of good quality and shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable supplier, except as otherwise may be provided in the Contract Documents.

7.4 Subcontractors and Suppliers

A. Contractor may retain subcontractors and suppliers for the performance of parts of the Work. Such subcontractors and suppliers must be acceptable to City.

7.5 Quality Management

A. Contractor is fully responsible for the managing quality to ensure Work is completed in accordance with the Contract Documents.

7.6 Licenses, Fees and Permits

A. Contractor shall pay all license fees and royalties and assume all costs incident to performing the Work or the incorporation in the Work of any invention, design, process, product, or device, which is the subject of patent rights or copyrights held by others.

B. Contractor shall obtain and pay for all construction permits and licenses unless otherwise provided in the Contract Documents.

7.7 Laws and Regulations; Taxes

A. Contractor shall give all notices required by and shall comply with all local, state, and

federal Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither City nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless City and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages if Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations.

C. Contractor shall pay all applicable sales, consumer, use, and other similar taxes Contractor is required to pay in accordance with Laws and Regulations.

7.8 Record Documents

A. Contractor shall maintain one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved shop drawings in a safe place at the Site. Contractor shall annotate them to show changes made during construction. Contractor shall deliver these record documents to Engineer upon completion of the Work.

7.9 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

B. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

.1 All persons on the Site or who may be affected by the Work;

.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

.3 Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.

C. All damage, injury, or loss to any property caused, directly or indirectly, in whole or in part, by Contractor, or anyone for whose acts the Contractor may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Contract Documents or to the acts or omissions of City or Engineer and not attributable, directly

or indirectly, in whole or in part, to the fault or negligence of Contractor).

D. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

E. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor shall act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby, or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.10 Shop Drawings, Samples, and Other Submittals

A. Contractor shall review and coordinate the shop drawing and samples with the requirements of the Work and the Contract Documents and shall verify all related field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information.

B. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

C. With each submittal, Contractor shall give Engineer specific written notice, in a communication separate from the submittal, of any variations that the shop drawing or sample may have from the requirements of the Contract Documents.

D. Engineer will provide timely review of shop drawings and samples.

E. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs.

F. Engineer's review and approval of a separate item does not indicate approval of the assembly in which the item functions.

G. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of shop drawings and submit, as required, new samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

H. Shop drawings are not Contract Documents.

7.11 Representations, Warranties and Guarantees

A. The Contractor warrants that:

.1 Contractor warrants and guarantees to City that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

.2 Contractor has full power and authority to enter into this Contract and to carry out the Project contemplated by this Contract.

.3 The Contractor warrants that Contractor will comply with all laws applicable to the performance of the Project under this Contract.

.4 The Contractor warrants that Contractor's execution, delivery, and performance of this Contract will not constitute: (i) a violation of any judgment, order, or decree binding on Contractor; (ii) a breach under any contract by which Contractor is bound; or (iii) an event that would, with notice or lapse of time, or both, constitute such a breach.

.5. The Contractor warrants that the Project will be performed with the degree of skill and care that is required by current, good, sound professional procedures and practices, and in conformance with generally accepted professional procedures and industry standards prevailing at the time the Project is performed, and that all work on the Project meet the specifications set forth herein. Contractor further represents and warrants that Contractor and all personnel used to perform the Project, including permitted subcontractors, possess the knowledge, skill, and experience necessary to perform the Project.

.6 The Contractor warrants that Contractor has, and shall maintain in effect for the duration of this Contract, all licenses, permits qualifications, and approvals of whatsoever nature which are legally required for Contractor to complete the Project. Contractor shall also ensure that all permitted subcontractors are similarly licensed and qualified.

7.12 Correction Period

A. If within one year after the date of substantial completion, any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly and without cost to City, correct such defective Work.

7.13 Indemnification

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless City and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any subcontractor, any technical , or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts they may be liable.

ARTICLE 8 CITY'S RESPONSIBILITIES

8.1 City's Responsibilities

A. Except as otherwise provided in the Contract Documents, City shall issue all communications to Contractor through Engineer.

B. City shall make payments to Contractor as provided in this Contract.

C. City shall provide Site and easements required to construct the Project.

D. If City intends to contract with others for the performance of other work at or adjacent to the Site, unless stated elsewhere in the Contract Documents, City shall have sole authority and responsibility for such coordination.

E. The City shall be responsible for performing inspections and tests required by applicable codes.

F. The City shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. City will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

G. While at the Site, City's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which City has been informed.

H. City shall furnish copies of any applicable City safety programs to Contractor.

ARTICLE 9 ENGINEER'S STATUS DURING CONSTRUCTION

9.2 Engineer's Status

A. Engineer will be City's representative during construction. The duties and

responsibilities and the limitations of authority of Engineer as City's representative during construction are set forth in this Contract.

B. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any subcontractor, any supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

C. Engineer will make visits to the Site at intervals appropriate to the various stages of construction. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work.

D. Engineer has the authority to reject Work if Contractor fails to perform Work in accordance with the Contract Documents.

E. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work.

F. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

ARTICLE 10 CHANGES IN THE WORK

10.1 Authority to Change the Work

A. Without invalidating the Contract and without notice to any surety, City may, at any time or from time to time, order additions, deletions, or revisions in the Work, in writing.

10.2 Change Orders

A. City and Contractor shall execute appropriate Change Orders covering:

.1 Changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; provided, however, that any increase in Contract Price has been duly appropriated by the City Council and authorized;

2. Changes in the Work which are: (a) ordered by City or (b) agreed to by the parties or (c) resulting from the Engineer's decision, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

3. Changes in the Contract Price or Contract Times or other changes which embody the substance of any final binding results under Article 12.

B. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 11 DIFFERING SUBSURFACE OR PHYSICAL CONDITIONS

11.1 Differing Conditions Process

A. If Contractor believes that any subsurface or physical condition including but not limited to utilities or other underground facilities that are uncovered or revealed at the Site either differs materially from that shown or indicated in the Contract Documents or is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency), notify City and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. After receipt of written notice, Engineer will promptly:

1. Review the subsurface or physical condition in question;

2. Determine necessity for City obtaining additional exploration or tests with respect to the condition;

3. Determine whether the condition falls within the differing site condition as stated herein;

4. Obtain any pertinent cost or schedule information from Contractor;

5. Prepare recommendations to City regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any

change in the Drawings or Specifications; and

6. Advise City in writing of Engineer's findings, conclusions, and recommendations.

C. After receipt of Engineer's written findings, conclusions, and recommendations, City shall issue a written statement to Contractor regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

ARTICLE 12 CLAIMS AND DISPUTE RESOLUTION

12.1 Claims Process

A. The party submitting a claim shall deliver it directly to the other party to the Contract and the Engineer promptly (but in no event later than 10 days) after the start of the event giving rise thereto.

B. The party receiving a claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the claim through the exchange of information and direct negotiations. All actions taken on a claim shall be stated in writing and submitted to the other party.

C. If efforts to resolve a claim are not successful, the party receiving the claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the claim within 45 days, the claim is deemed denied.

D. If the dispute is not resolved to the satisfaction of the parties, City or Contractor shall give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction unless the City and Contractor both agree to submit the dispute to mediation, prior to any litigation. In that case, an alternative dispute resolution firm located in Pulaski County, Arkansas, agreed upon by the parties, shall conduct mediation. The parties shall share the costs of mediation equally.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION OF DEFECTIVE WORK

13.1 Tests and Inspections

A. City and Engineer will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access.

B. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

C. If any Work that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense.

13.2 Defective Work

A. Contractor shall ensure that the Work is not defective.

B. Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. Prompt notice of all defective Work of which City or Engineer has actual knowledge will be given to Contractor.

D. The Contractor shall promptly correct all such defective Work.

E. When correcting defective Work, Contractor shall take no action that would void or otherwise impair City's special warranty and guarantee, if any, on said Work.

F. If the Work is defective or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then City may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

ARTICLE 14 - PAYMENTS TO CONTRACTOR

14.1 Progress Payments

A. The Contractor shall prepare a schedule of values that will serve as the basis for progress payments. The schedule of values will be in a form of application for payment acceptable to Engineer. The unit price breakdown submitted with the bid will be used for unit price work, as described in Section 5.02. Break lump sum items into units that will allow for measurement of Work in progress.

14.2 Applications for Payments:

A. Contractor shall submit an application for payment in a form acceptable to the Engineer, no more frequently than monthly, to Engineer. Applications for payment will be prepared and signed by Contractor. Contractor shall provide supporting documentation required by the Contract Documents. Payment will be paid for Work completed as of the date of the application for payment.

B. Beginning with the second application for payment, each application shall include an

affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior applications for payment.

14.3 Retainage

A. The City shall retain 5% of each progress payment until the Work is substantially complete.

14.4 Review of Applications

A. Within 10 days after receipt of each Application for Payment, the Engineer will either indicate in writing a recommendation for payment and present the Application for Payment to City or return the Application for Payment to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. The Contractor will make the necessary corrections and resubmit the application for payment.

B. Engineer will recommend reductions in payment (set-offs) which, in the opinion of theEngineer, are necessary to protect City from loss because the Work is defective and requires correction or replacement.

C. The City is entitled to impose set-offs against payment based on any claims that have been made against City on account of Contractor's conduct in the performance of the Work, incurred costs, losses, or damages on account of Contractor's conduct in the performance of the Work, or liquidated damages that have accrued as a result of Contractor's failure to complete the Work.

14.5 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to City free and clear of (1) all liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by City.

14.6 Substantial Completion

A. The Contractor shall notify City and Engineer in writing that the Work is substantially complete and request the Engineer issue a certificate of substantial completion when Contractor considers the Work ready for its intended use. Contractor at the same time shall submit to City and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Engineer will make an inspection of the Work with the City and Contractor to determine

the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor and City in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete or upon resolution of all reasons for non-issuance of a certificate identified in 14.06.B, Engineer will deliver to City a certificate of substantial completion which shall fix the date of substantial completion and include a punch list of items to be completed or corrected before final payment.

14.7 Final Inspection

A. Upon written notice from Contractor that the entire Work is complete, Engineer will promptly make a final inspection with City and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.8 Final Payment

A. Contractor may make application for final payment after Contractor has satisfactorily

completed all Work defined in the Contract, including providing all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents and other documents.

B. The final application for payment shall be accompanied (except as previously delivered) by:

.1 All documentation called for in the Contract Documents;
.2 Consent of the surety to final payment;
.3 Satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to City free and clear of any liens or other title defects, or will so pass upon final payment;
.4 A list of all disputes that Contractor believes are unsettled; and
.5 Complete and legally effective releases or waivers (satisfactory to City) of all lien rights arising out of the Work, and of liens filed in connection with the Work

C. The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

14.9 Waiver of Claims

A. The making of final payment will not constitute a waiver by City of claims or rights against Contractor.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against City other than those pending matters that have been duly submitted.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.1 City May Suspend Work

A. At any time and without cause, City may suspend the Work or any portion thereof for a period of not more than 60 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, upon submitting documentary evidence of loss directly attributable to any such suspension, to the satisfaction of City.

15.2 City May Terminate for Cause

A. Contractor's failure to perform the Work in accordance with the Contract Documents or other failure to comply with a material term of the Contract Documents will constitute a default by Contractor and justify termination for cause.

B. If Contractor defaults in its obligations, then after giving Contractor and any surety ten days written notice that City is considering a declaration that Contractor is in default and termination of the Contract, City may proceed to:

.1 Declare Contractor to be in default, and give Contractor and any surety notice that the Contract is terminated; and
.2 Enforce the rights available to City under any applicable performance bond.

C. City may not proceed with termination of the Contract under Paragraph 9.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

D. Subject to the terms and operation of any applicable performance bond, if City has terminated the Contract for cause, City may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which City has paid Contractor but which are stored elsewhere, and complete the Work as City may deem expedient.

E. In the case of a termination for cause, if the cost to complete the Work, including related claims, costs, losses, and damages, exceeds the unpaid contract balance, Contractor shall pay the difference to City.

15.3 City May Terminate for Convenience

A. Notwithstanding any other provision of this Contract, upon seven days written notice to Contractor, the City may, without cause and without prejudice to any other right or remedy of City, terminate the Contract, This right includes, but is not limited to, termination due to non-appropriation of funds in sufficient amounts to discharge such obligation; such failure (i) shall act to terminate this Contract at such time as the then-existing and available appropriations are depleted, and (ii) neither such failure nor termination shall constitute a default or breach of this Contract, including any sub-agreement, attachment, schedule, or exhibit thereto, by the City. As used herein, the term "appropriation" shall mean and include the due adoption of an appropriation ordinance and budget and the approval of availability of sufficient funds for the performance of fiscal obligations arising under this Contract. In such case, without duplication of any items, Contractor shall be paid for::

.1 Completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

.2 Expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work; and

.3 Other reasonable, documented expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

15.4 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by City or under an order of court or other public authority, or (2) City fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to City, and provided City does not remedy such suspension or failure within that time, either stop the Work until payment is received, or terminate the Contract and recover payment from the City.

ARTICLE 16 CONTRACTOR'S REPRESENTATIONS

16.1 Contractor's Representations

A. In order to induce City to enter into this Contract Contractor makes the following representations:

.1 Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

.2 Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance

of the Work.

.3 Contractor is familiar with and is satisfied as to all federal, state and local laws, regulations, and ordinances that may affect cost, progress, and performance of the Work. All Work shall be completed in accordance with all applicable federal, state, and local laws, regulations, and ordinances.

.4 Contractor has carefully studied all: (1) drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), if applicable, which have been provided as described in paragraph 5.03 of the EJCDC Standard General Conditions of the Construction Contract, as modified and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the General Conditions, if applicable, as provided in paragraph 5.06 of the EJCDC Standard General Conditions of the Construction Contract, as modified.

.5 Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.

.6 Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

.7 Contractor is aware of the general nature of work to be performed by City and others at the Site that relates to the Work as indicated in the Contract Documents.

.8 Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

.9 Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

.10 The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 17 DEFINITIONS

17.1 Addenda—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

17.2 Agreement—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

17.3 Application for Payment—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Document

17.4 Change Order—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

17.5 Claim – A dispute between Contractor and City arising from the Work seeking resolution of a contractual issue.

17.6 Contract—The entire and integrated written contract between Owner and Contractor concerning the Work.

17.7 Contract Documents—Those items so designated in the Agreement, and which together comprise the Contract.

17.8 Contract Price—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

17.9 Contract Times—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

17.10 Contractor—The individual or entity with which Owner has contracted for performance of the Work.

17.11 Drawings—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

17.12 Effective Date of the Contract—The date, indicated in the Agreement, on which the Contract becomes effective.

17.13 Electronic Means—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of

the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

17.14 Engineer—The individual or entity named as such in the Agreement.

17.15 Field Order—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

17.16 Hazardous Environmental Condition—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

17.17 Laws and Regulations; Laws or Regulations—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

17.18 Liens—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

17.19 Notice to Proceed—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

17.20 Owner—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

17.21 Progress Schedule—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

17.22 Project—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

17.23 Samples—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

17.24 Schedule of Values—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

17.25 Shop Drawings—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

17.26 Site—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

17.27 Specifications—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

17.28 Subcontractor—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

17.29 Submittal—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

17.30 Substantial Completion—The time at which the Work (or a specified part thereof) has

progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

17.31 Supplier—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

17.32 Underground Facilities—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

17.33 Unit Price Work—Work to be paid for on the basis of unit prices.

17.34 Work—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

17.35 Work Change Directive—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

ARTICLE 18 MISCELLANEOUS

18.1 Terms

A. Terms used in this Contract will have the meanings indicated in the standard General Conditions of the Construction Contract, as modified.

18.2 Restrictions on Public Improvement Contracts

A. In accordance with the Bid Documents, all bid documents related to public improvements exceeding $75,000 in value must include a statement that encourages participation of small, minority, and women's business enterprises.

B. Contractor, in accordance with Ark. Code Ann. §§ 18-44-503 and 22-9-401, must furnish a surety bond in an amount equal to the contract price.

C. In accordance with Ark. Code Ann. § 22-9-601, et seq., Contractor is subject to the retainage provisions which allows the City to retain five percent (5%) of payments until final project completion.

D Contractor acknowledges that a public right-of-way is an easement used for ingress and egress to property. The City holds these easements for the benefit of the public at large. As part of any public improvement contract performed in or about public rights-of-way, the City requires and Contractor agrees that such rights-of-way will be repaired, to the extent possible, to the condition prior to the performance of work.

18.3 Choice of Law

A. The parties hereto agree that this Contract shall be construed under Arkansas law, excluding its conflict of laws rules. The parties further agree that proper jurisdiction and venue for any cause of action arising from this Contract shall be vested in either the U.S. District Court for the Eastern District of Arkansas or the Circuit Court of Pulaski County, Arkansas.

18.4 Non-Waiver

A. No delay or failure to exercise any right under this Contract shall impair any such right or be construed to be a waiver thereof. No waiver shall be effective unless in writing signed by the party waiving. A waiver of a right on one occasion shall not be deemed to be waiver of such right on any other occasion. A waiver of a right on one occasion shall not be deemed to be a waiver of any other right on that occasion.

18.5 No Assignment.

A. The Project to be performed pursuant to this Contract is personal in nature, and Contractor may not, voluntarily or by operation of law, assign or transfer any of its rights or obligations under this Contract without the prior written consent of the City.

18.6 Merger

A. This Contract constitutes the full understanding of the parties, a complete allocation of risks between them and a complete and exclusive statement of the terms and conditions of their agreement, related to the services provided hereunder. All prior agreements, negotiations, dealings and understandings, whether written or oral, regarding the subject matter hereof, are superseded by and merged into this Contract.

18.7 Modification

A. No conditions, usage of trade, course of dealing or performance, understanding or agreement purporting to modify, vary the terms or conditions of the Contract shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification shall be

effected by the acknowledgment or acceptance of any forms containing terms or conditions or variance with or in addition to those set forth in this Contract.

18.8 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon City and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

18.9 Cumulative Remedies

A. The duties and obligations imposed by this Contract and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.10 Limitation of Damages

A. Neither City, Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.11 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.12 Contractor's Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract.

18.13 No Presumption against Drafter

A. Each of the parties hereto has jointly participated in the negotiation and drafting of this Contract. In the event an ambiguity or a question of intent or interpretation arises, this Contract shall be construed as if drafted jointly by each of the parties hereto and no presumptions or burdens

of proof shall arise favoring any party by virtue of the authorship of any provisions of this Contract.

18.14 Counterpart Execution

A. This Contract may be executed in two or more counterparts, each of which is deemed as original but all constitute one and the same instrument. An original signature transmitted by facsimile or other electronic means shall be deemed to be original.

18.15 Filing. This document shall be filed in the official records of the City Clerk of the City of North Little Rock, Arkansas. Either party may additionally file this document in any other governmental office deemed appropriate; however, the parties waive all claims and defenses in law or equity based upon such additional filing.

[Signatures on the Next Page]

IN WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

City of North Little Rock	**[Contractor]**
By: _____	By: _____
Terry Hartwick, Mayor	**Name and Title**
_____	_____
Date	**Date**

ATTEST:

_____
Diane Whitbey, City Clerk

Contract reviewed and approved as to form by:

Amy Beckman Fields
North Little Rock City Attorney

BY: _____
Deputy City Attorney **Date**

NOTICE TO PROCEED

TO:

PROJECT: STONE LINKS SUBDIVISION – MULTI-PIPE MAINTENANCE REHABILITATIONS – City Project No. 21-08

You are hereby notified to commence WORK in accordance with the Contract dated _____ on or before _____ , and you are to complete the WORK within _____consecutive calendar days thereafter. The date of completion of all WORK is therefore **_____, 20__.**

Owner

By _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____ this the _____ day of _____ 20___.

By _____

Title _____

Contractor's Application for Payment No. _____

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	**$**	
2. Net change by Change Orders	**$**	
3. Current Contract Price (Line 1 ± 2)	**$**	
4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)	**$**	
5. RETAINAGE:		
a. X _____ Work Completed	**$**	
b. X _____ Stored Material	**$**	
c. Total Retainage (Line 5a + Line 5b)	**$**	
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)	**$**	
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	**$**	
8. AMOUNT DUE THIS APPLICATION	**$**	
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)	**$**	

Contractor's Certification

The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding Agency (if applicable) (Date)

Endorsed by the Construction Specifications Institute.

Progress Estimate

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A		B	Work Completed		E	F		G
Item			C	D				
Specification Section No.	Description	Scheduled Value	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F) B	Balance to Finish (B - F)
	Totals							

Progress Estimate

Contractor's Application

For (contract):							Application Number:			
Application Period:							Application Date:			
A				B	C	D	E	F		
Item		Bid Quantity	Unit Price	Bid Value	Estimated Quantity Installed	Value	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F) B	Balance to Finish (B - F)
Bid Item No.	Description									
	Totals									

Stored Material Summary

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A	B	C	D		E		F		G
Invoice No.	Shop Drawing Transmittal No.	Materials Description	Stored Previously		Stored this Month		Incorporated in Work		Materials Remaining in Storage ($) (D + E - F)
			Date (Month/Year)	Amount ($)	Amount ($)	Subtotal	Date (Month/Year)	Amount ($)	
		Totals							

Change Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project:	Owner: City of North Little Rock Arkansas	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: Project No.

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:	**CHANGE IN CONTRACT TIMES:**
Original Contract Price: $_____	Original Contract Times: ☐ Working days ☐ Calendar days Substantial completion (days or date): _____ Ready for final payment (days or date): _____
[Increase] [Decrease] from previously approved Change Orders No._____to No._____: $_____	[Increase] [Decrease] from previously approved Change Orders No._____to No._____: Substantial completion (days): _____ Ready for final payment (days): _____
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial completion (days or date): _____ Ready for final payment (days or date): _____
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial completion (days or date): _____ Ready for final payment (days or date): _____
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial completion (days or date): _____ Ready for final payment (days or date): _____

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable):

_____ Date: _____

Change Order

Instructions

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Price or Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Owner or Contractor for approval, depending on whether the Change Order is a true order to the Contractor or the formalization of a negotiated agreement for a previously performed change. After approval by one contracting party, all copies should be sent to the other party for approval. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

LIEN RELEASE

NAME OF GENERAL CONTRACTOR:

_____

PROJECT: **Main Street Gravity/Pump Station Outfall Replacement**

ENGINEER'S PROJECT NUMBER: City Project No. 12-05

PAY REQUEST NUMBER: _____

The undersigned Contractor certifies that: (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied to discharge in full all obligations of CONTRACTOR incurred in connection with Work covered by Prior Applications for Payment numbered 1 through inclusive; (2) title to all Work, materials, labor, and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all (i.e., all stored materials, subcontracted work, labor, materials, equipment, and other items incorporated into Work have been paid to date by the Contractor) liens, claims, security interest, and encumbrances; and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not *defective* as that term is defined in Contract Documents.

If it is found that material or work has not been paid as sworn on this document, the full amount of the unpaid payment shall be withheld from the next pay estimate, and a check will be prepared by the Owner, made out jointly to the Contractor and the payee for materials or work. The check will be mailed to the payee.

Signed this ___ day of _____, 20___.

Subscribed and Sworn to before me

this _____day of ___, 20___.

_____
Contractor

By_____

Notary Public

Title_____

My commission expires the _____day of _____, 20___.

Certificate of Substantial Completion

Project:	
Owner: City of North Little Rock	Owner's Contract No.:
Contract:	Engineer's Project No.:

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents: ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

☐ Amended Responsibilities ☐ Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer	Date
Accepted by Contractor	Date
Accepted by Owner	Date

State of Arkansas
Arkansas Department of Labor
Arkansas Occupational Safety and Health

10421 WEST MARKHAM • LITTLE ROCK, AR 72205-2190
Phone: 501-682-9091 Fax: 501-682-4532 TRS: 800-285-1131

CONTRACT FOR EXCAVATION REPORTING FORM

This form must be completed by any public body (state agency, county, municipality, school district, or other local tax unit or improvement district) awarding a contract for a public construction project which will involve any trench or excavation of five feet (5') or more. ***Arkansas Code § 22-9-212.***

Name of Public Agency:_____

Address of Public Agency:_____

Contact Person:_____Phone number:_____

Person Filing Report:_____

Name of General Contractor:_____

Address:_____Phone number:_____

Name of any subcontractor doing trenching or excavation;_____

Subcontractor address:_____Phone number:_____

Estimated start date:_____

Estimated completion date:_____

Site location/address/street/road:_____

Arkansas Code § 22-9-212 also requires that the current federal OSHA standard for excavation and trenching be incorporated into the project's specifications and that the contract bid form include a separate pay item for trench or excavation safety systems.

The Arkansas Department of Labor provides free training on trenching and excavation safety.

SEND NOTICE TO:

Arkansas Department of Labor
Safety Division
10421 West Markham Street
Little Rock, AR 72205-2190
(501) 682-9091
fax: (501) 682-4532
e-mail: mike.watson@arkansas.gov

STATE OF ARKANSAS
DEPARTMENT OF LABOR
ARKANSAS OCCUPATIONAL SAFETY & HEALTH

10421 WEST MARKHAM • LITTLE ROCK, AR 72205-2190
Phone: 501-682-9091 Fax: 501-682-4532 TRS: 800-285-1131

REPORTING FORM FOR WORK NEAR OVERHEAD HIGH VOLTAGE POWER LINES AND CONDUCTORS

This form must be completed by any person, firm, or corporation that desires to carry on any work or activity within ten feet (10') of overhead energized electrical lines or conductors. *Arkansas Code § 11-5-307*. The ten feet clearance applies to any part of any machinery, equipment or materials, as well as any employee or person.

Name of company or individual:_____

Address:_____ Phone Number:_____

Name & title of person filing report:_____

Date work to be performed:_____

Expected date of completion:_____

Has the operator of the electrical lines been notified?_____

IMPORTANT

*Arkansas Code § 11-5-307 also requires written notice to the owner or operator of the electrical lines. You must also make appropriate arrangements with the operator of the electrical lines **before** proceeding with any work which would violate the ten feet clearance requirement.*

The Arkansas Department of Labor provides free training on working safely near high voltage lines.

SEND NOTICE TO:

Arkansas Department of Labor
Safety Division
10421 West Markham Street
Little Rock, AR 72205
(501) 682-9091
fax: (501) 682-4532
e-mail: mike.watson@arkansas.gov

SECTION SP-1 – ARDOT SPECIFICATIONS

GENERAL

SP1-1.1 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

SP1-2.1 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.

SP1-2.2 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.

SP1-2.3 Individual material test numbers change from time to time. Use the latest applicable test.

SP1-2.4 Reference in the Standard Specifications to the “Department” are herein changed to the “Owner”.

END OF SECTION SP-1

SECTION 1 – SITE PREPARATION

DESCRIPTION

1.1-1 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."

1-1.2 The item "SITE PREPARATION" shall include:

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

CONSTRUCTION METHODS

1-2.1 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.

1-2.2 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."

1-2.3 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."

1-2.4 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

1-3.1 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 1

SECTION E-2 – EXCAVATION

DESCRIPTION

E2-1.1 This section addresses the requirements of all earthwork necessary for street and drainage construction within the project area in accordance with the Plans. The work shall be in conformity with the lines, grades, thicknesses, and typical sections as shown in the Plans or established by the Engineer.

STANDARDS

E2-2.1 All materials and work shall be in accordance with the lines and grades shown on 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

E2-3.1 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

E2-4.1 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 undercut as shown on the plans. This excavated unsuitable material shall be disposed of off-site.

E2-4.2 OVER-EXCAVATION: Where excavation is carried below or beyond that required, the space shall be filled to grade with Class 7 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.

E2-4.3 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 excavation.

END OF SECTION E-2

SECTION E-4 – TRENCH AND EXCAVATION SAFETY SYSTEMS

DESCRIPTION

E4-1.1 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

E4-2.1 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

E4-3.1 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.

E4-3.2 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

E4-4.1 Trench or excavation safety systems shall be measured as a complete unit.

BASIS OF PAYMENT

E4-5.1 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:

Item E4-5.1 Trench and Excavation Safety System - per lump sum

END OF SECTION E-4

Regulatory Review of
29 CFR 1926, Subpart P:

Excavations

Pursuant to
Section 610 of the Regulatory Flexibility Act
and Section 5 of Executive Order 12866

Occupational Safety and Health Administration
Directorate of Evaluation and Analysis
Office of Evaluations and Audit Analysis

March 2007

Table of Contents

Executive Summary

On October 31, 1989, OSHA issued a final revised standard for excavation and trenching.[1] The revision updated the previous standard by simplifying many of the existing provisions, adding and clarifying definitions, eliminating duplicate provisions and ambiguous language, and giving employers added flexibility in providing protection for employees. In addition, the standard provided several new appendices. One appendix provided a consistent method of soil classification. Others provided sloping and benching requirements, pictorial examples of shoring and shielding devices, timber tables, hydraulic shoring tables, and selection charts that provide a graphic summary of the requirements contained in the standard.

This regulatory review of the Excavations Standard meets the requirements of both Section 610 of the Regulatory Flexibility Act and Section 5 of Executive Order (EO) 12866. Under Section 610, this review examines whether the standard should be continued without change, rescinded, or amended to minimize any significant impact on a substantial number of small entities considering the continued need for the rule, comments and complaints received, complexity of the rule, whether the rule is duplicative, and the degree to which technology and economic conditions have changed since its issuance. Under Section 5 of EO 12866, this review examines whether the standard has become unjustified or unnecessary as a result of changed circumstances, and whether the standard is compatible with other regulations or is duplicative or inappropriately burdensome in the aggregate. This review also ensures that the regulation is consistent with the priorities and the principles set forth in EO 12866 within applicable law, and examines whether the effectiveness of the standard can be improved. To assist OSHA in this review, OSHA requested public comments on these issues.

The Section 610 review of the standard finds the following:

- There is a continued need for the standard. The annual number of trenching and excavation fatalities has declined from an estimated 90 fatalities per year prior to the enactment of the 1989 standard, to approximately 70 per year since 1990. This 22% reduction is even more impressive given the 20% real increase in construction activity over this period. Therefore, in relation to increased construction activity, fatalities have been reduced by more than 40%. Although the standard has improved safety, it remains needed in light of the ongoing occurrence of related fatalities most of which result from violations of the standard. OSHA intends to expand outreach and maintain enforcement to further reduce fatalities.

- The standard was revised in 1989 to reduce complexity and add clarity. There is no indication that employers are unable to comply due to the complexity of the revised standard. Nonetheless, public comments suggested some ways in which the standard might be simplified or clarified (although some argued that any changes would only serve to confuse and discourage those who now understand and follow the standard). The expanded outreach will address these matters.

- In general, the standard does not overlap, duplicate, or conflict with other state or federal rules. Several commenters, however, identified a possible conflict between the

[1] 54 FR 45894, October 31, 1989; 29 CFR 1926, Subpart P.

Excavations Standard and OSHA's standard for confined spaces. OSHA will address this issue in its future rulemaking for confined spaces in construction.

- Economic and technological trends have not reduced the need for the standard. However, the development of so-called "trenchless" technologies (e.g., directional boring machines) has added a new dimension to excavation work (including additional hazards) that OSHA will monitor.

- Public comments contained some specific suggestions for how the standard could be made more effective, although the comments were divided as to whether or not the standard should be modified. In light of the effectiveness of the standard, the certainty it has created, and limited regulatory resources, major modifications are not of high priority.

- The National Transportation Safety Board (NTSB) recommended the OSHA amend the Excavations standard to require employers to notify appropriate authorities after excavation activities create a gas leak or leak of other hazardous substances. Since then, the "Pipeline Inspection, Protection, Enforcement, and Safety Act (PIPES) of 2006" has been enacted. Section 2 of PIPES requires all persons (including employers) engaged in demolition, excavation, tunneling, or construction to immediately call 911 if: (1) they damage a pipeline that may endanger life or cause serious bodily harm or damage to property; and (2) such damage results in the escape of flammable, toxic, or corrosive gas or liquid. The enactment of PIPES may obviate the need for OSHA to promulgate a standard implementing the NTSB's recommendation. It also may affect OSHA's authority to issue such a standard. OSHA will monitor the implementation of PIPES and consider whether amending the excavations standard as suggested by NTSB is necessary and appropriate.

- The standard does not impose an unnecessary or disproportionate burden on small businesses or on industry in general. The cost of protective systems has decreased by about 10 percent in real dollars between 1990 and 2001. The number of small businesses engaged in excavation activity has increased and the percentage of excavation work done by small business has increased. Real construction activity has increased.

Based on the findings of this review, OSHA finds that the Excavations Standard should be continued. OSHA also believes that further increases in safety might be achieved, through increased outreach and training.

OSHA's review of the Excavations Standard under Executive Order 12866 finds the following:

- The standard has significantly reduced the annual number of fatalities (from 90 to 70, on average) resulting from accidents involving excavations and trenching, despite growth in the relevant industry sectors. The standard remains justified and necessary in light of ongoing hazards and fatalities.

- In general, the standard is compatible and not duplicative with other state or federal rules. Several commenters, however, identified a possible conflict between the

Excavations Standard and OSHA's standard for confined spaces which OSHA will address in a further rulemaking for confined spaces in construction.

- The standard remains consistent with the President's priorities to the extent that it has produced the intended benefits, a reduction in trenching and excavation fatalities and injuries, while not causing negative economic effects.

- In light of suggestions contained in public comments, and given the ongoing incidence of accidents, injuries, and fatalities occurring each year during excavation and trenching activities, generally from violations of the standard, OSHA intends to evaluate whether further increases in safety can be achieved by various means such as expanded outreach and training.

1. Introduction and Background

Excavation accidents and fatalities most frequently involve cave-ins of excavations or trenches, but also may result from a variety of other accident types, including machine accidents, falling objects, electrocution, vehicular accidents, explosions or fires, falls, drowning, and asphyxiation due to noxious fumes. In 1987, prior to OSHA's 1989 revision of the standards protecting workers in or near excavations and trenches, OSHA estimated the average annual number of excavation-related fatalities at 90.[2] OSHA also estimated that the 1989 revision to the standard would reduce annual fatalities to 70 (a 22 percent reduction).

It now has been over ten years since the promulgation of the 1989 revision to the Excavations Standard. The purpose of this study is to "look back" and review the current standard, in accordance with Section 610 of the Regulatory Flexibility Act and Section 5 of Executive Order 12866, to determine whether the rule has functioned as intended, whether it could be simplified or improved, or whether it is no longer needed and should be rescinded.

The study methodology consists of evaluating the industries that conduct excavation and trenching activities, examining available literature and data on accidents and compliance issues, assessing trends in compliance costs, and considering issues raised by the public with respect to the standard. The remainder of this first chapter provides background information that is helpful in understanding the issues and analyses presented in this study. Section 1.1 discusses, in additional detail, the nature of the review. Section 1.2 briefly introduces and summarizes the basic types of systems available to protect workers from cave-ins of soil at sites where excavation or trenching activities are being conducted. Section 1.3 provides an overview of the history of the Excavations Standard. Finally, Section 1.4 describes the provisions in the current standard.

1.1 Nature of the Review

In 2002, the Occupational Safety and Health Administration (OSHA) began a review of its Excavations Standard under Section 610 of the Regulatory Flexibility Act[3] and Section 5 of Executive Order (EO) 12866 on Regulatory Planning and Review.[4]

The purpose of a review under Section 610 of the Regulatory Flexibility Act:

> "(S)hall be to determine whether such rule should be continued without change, or should be rescinded, or amended consistent with the stated objectives of applicable statutes to minimize any significant impact of the rules on a substantial number of small entities."
>
> "The Agency shall consider the following factors:
>
> (1) The continued need for the rule;

[2] *Economic Impact Analysis of the Proposed Revision to OSHA Subpart P Standard (§1926.650-652) Governing Trenching and Excavation Work,* prepared for OSHA's Office of Regulatory Analysis by Eastern Research Group, Inc., May 19, 1987.

[3] 63 FR 34139, June 23, 1998. For complete text of the Regulatory Flexibility Act, Section 610, 5 U.S.C. 601 *et seq.,* see Appendix I.

[4] For the text of EO 12866, see Appendix II.

(2) The nature of complaints or comments received concerning the rule from the public;
(3) The complexity of the rule;
(4) The extent to which the rule overlaps, duplicates or conflicts with other Federal rules, and, to the extent feasible, with State and local governmental rules; and
(5) The length of time since the rule has been evaluated or the degree to which technology, economic conditions, or other factors have changed in the area affected by the rule."

The review requirements of Section 5 of EO 12866 require agencies:

> "To reduce the regulatory burden on the American people, their families, their communities, their State, local, and tribal governments, and their industries; to determine whether regulations promulgated by the [Agency] have become unjustified or unnecessary as a result of changed circumstances; to confirm that regulations are both compatible with each other and not duplicative or inappropriately burdensome in the aggregate; to ensure that all regulations are consistent with the President's priorities and the principles set forth in this Executive Order, within applicable law; and to otherwise improve the effectiveness of existing regulations."

To carry out these reviews, on August 21, 2002, OSHA asked the public for comments on all issues raised by these provisions (67 FR 54103). Specifically, OSHA requested comments on the impacts of the rule on small businesses; the benefits and utility of the rule in its current form and, if amended, in its amended form; the continued need for the rule; the complexity of the rule; and whether, and to what extent, the rule overlaps, duplicates, or conflicts with other Federal, State, and local government rules. OSHA also asked for comments on new developments in technology, economic conditions, or other factors affecting the ability of covered firms to comply with the standard. Furthermore, OSHA asked for comments on alternatives to the rule that would minimize significant impacts on small businesses, while achieving the objectives of the Occupational Safety and Health Act.

OSHA accepted written comments from August 21, 2002 through November 19, 2002. All documents and comments received relevant to the review and documents discussed in this report are available at the OSHA Docket Office, Docket No. S204A (now Docket No. OSHA-2007-0012), Technical Data Center, Room N-2625, U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, DC 20210, Telephone (202) 693-2350, http://www.regulations.gov

1.2 Overview of Protective Systems Guarding Against Cave-Ins

Most accidents involving excavations or trenching are the result of soil cave-ins. There are three basic types of systems used to protect workers from the danger of cave-ins: sloping, shielding, and shoring. Although the concept behind each system is relatively simple, differences in soil types and other job-related factors make the selection and implementation of an appropriately designed protective system a matter requiring judgment and qualifications.

The simplest manner of controlling cave-ins is to slope the walls of the excavation at an angle such that soil does not roll into the excavation. The degree of the sloping angle needed depends on the stability of the soil at the site. In more stable soils, the slope can be relatively

steeper than in less stable soils and still be effective. Sloping must be greater if the areas near the excavation are subject to heavy loads (e.g., soil piles, vehicles).

Trench shields do not prevent cave-ins. Instead, they protect employees from cave-ins that might occur by providing sheltered space where employees may work. A typical shield consists of two steel plates separated by structural members to form a box open at the top, bottom, and both ends. The box is lowered into the trench so that the steel plates face the trench's side walls. Employees then climb into the protected area defined by the steel plates. As the work progresses, the box is dragged along the bottom of the trench by a chain or cable suspended from a backhoe above the ground.

Shoring systems are structures made of wood or metal members that press tightly against an excavation side wall to brace and support the sidewalls and thereby prevent cave-ins. Aluminum hydraulic shores consist of two vertical members that support opposite sides of a trench and at least one connecting horizontal member containing hydraulic fluid that is pumped up to exert pressure on the vertical members. Timber shoring achieves similar support but is constructed out of timbers at the excavation site based on job-specific requirements.

1.3 Regulatory History

Trenching and excavation in construction were first regulated in 1969. For almost two decades, trenching and excavation standards were discussed, reviewed, and subject to technical amendments. Following a public hearing and public comments, OSHA issued a new construction standard for excavation in 1989. The important developments leading to the current Excavations Standard are as follows.

In 1969, Congress amended the Contract Work Hours Standards Act (40 U.S.C. 327 et seq.) by adding a new section 107 (40 U.S.C. 333) to provide employees in the construction industry with a safer work environment and to reduce the frequency and severity of construction accidents and injuries. The amendment, commonly known as the Construction Safety Act (Pub. L. 91-54; Aug. 9, 1969), provided occupational safety and health standards for employees in the building trades and construction industry in Federal and federally-financed and federally-assisted construction projects.

In 1971, the Secretary of Labor issued Safety and Health Regulations for Construction in 29 CFR part 1518[5] under the Contract Work Hours and Safety Standards Act. Included in these regulations were safety standards for trenching and excavation. OSHA adopted the trenching and excavation requirements contained in the Construction Safety Act standard as an OSHA standard in 1971.

OSHA made several technical amendments to the trenching and excavations standards, codified in Subpart P, in 1972,[6] after review by the Advisory Committee on Construction Safety and Health (ACCSH) and rulemaking.

Responding to continuing complaints concerning the adequacy of the standards in Subpart P, OSHA engaged the National Bureau of Standards (NBS) in 1976 to study the compatibility of the technical provisions in the standard with actual construction practices. During 1979 and

[5] 36 FR 7340, April 17, 1971.
[6] 37 FR 3512, February 17, 1972.

1980, six NBS reports were issued after extensive review and public discussion of recommendations. Industry sponsored a series of workshops during 1981 to discuss ways of implementing the NBS recommendations. NBS prepared final recommendations for technical changes to the standard incorporating comments from the workshops.

In 1982, OSHA developed proposed changes to the standard to address continuing excavation-related accidents, compliance problems, and public requests to update the standards. The proposal was modified to reflect review by the ACCSH, and an NPRM was published in April 1987 in the Federal Register.[7] The proposal updated the existing standard to simplify many of the existing provisions, add and clarify definitions, eliminate duplicate provisions and ambiguous language, and give employers added flexibility in providing protection for employees. In addition, the standard provided several new appendices. One appendix provided a consistent method of soil classification. Others provided sloping and benching requirements, pictorial examples of shoring and shielding devices, timber tables, hydraulic shoring tables, and selection charts that provide a graphic summary of the requirements contained in the standard. A public hearing was convened in October 1987.

On October 31, 1989, after receiving comments on its proposed standards, holding a public hearing, consulting with the ACCSH, and examining the costs of compliance for the construction industry, OSHA issued a final standard for excavation and trenching.[8] An amendment promulgated in 1994 provided that walkways crossing over excavations deeper than six feet must be supplied with guardrails.[9]

1.4 Requirements of the Excavations Standard

OSHA has published a number of documents that describe the provisions of the Excavations Standard for employers and employees in construction.[10] The standard applies to all open excavations made in the earth's surface, which includes trenches.

Protective Systems. To prevent employee exposure to cave-ins, the standard requires sloping or benching the sides of all excavations, supporting the sides of the excavation (shoring), or placing a shield between the side of the excavation and the work area. To address the complexities of designing a protective system based on the many variables that an employer can encounter, the standard provides several different methods and approaches, including four for sloping and four for shoring, including the use of shields. The standard does not require the installation and use of a protective system when an excavation is made entirely in stable rock, or is less than five feet deep and a competent person has examined the ground and found no indication of a potential cave-in.

If sloping is used as the protective system, the employer has the option of using a predetermined slope with an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal). These slopes must be excavated to form configurations that are in accordance with those for Type C soil found in Appendix B of the

[7] 52 FR 12288, April 15, 1987.
[8] 54 FR 45894, October 31, 1989; 29 CFR 1926, Subpart P.
[9] 59 FR 40730, August 9, 1994.
[10] For example, Excavations, U.S. Department of Labor, Occupational Safety and Health Administration, OSHA 2226, 2000 (Reprinted) was originally issued in print and is now available on line at the OSHA web site: www.osha.gov.

standard. A slope of this gradation or less is considered safe for any soil type. Another option is to determine slopes and configurations using Appendices A and B. This approach allows the employer to determine the maximum slope based on site-specific variables.

Another design method that applies to both sloping and shoring allows the employer to use tabulated data, such as tables and charts approved by a professional engineer, to design the excavation. These data must be in writing and must include sufficient explanatory information to enable the user to make a selection, including the criteria for determining the selection and limits of the data. A copy of the information must be kept at the worksite during construction of the protective system. Upon completion of the system, the data may be stored away from the job site, but must be made available to the Assistant Secretary of Labor upon request. A final option allows an employer to use a registered professional engineer to design the sloping or benching system based on professional judgment.

The standard allows an employer to use shoring or a trench box or shield that is either designed or approved by a registered professional engineer or is based on tabulated data prepared or approved by a registered engineer. Timber, aluminum, or other suitable material may be used. The standard permits the use of a trench shield as long as the protection it provides is equal to or greater than the protection that would be provided by the appropriate shoring system. The requirements for trench boxes and shields allow employers more flexibility in design, but impose an obligation to follow manufacturer's instructions for pre-made boxes and shields once a design has been chosen.

Adjacent Structures. The employer must provide support systems, such as shoring, bracing, or underpinning, to ensure the stability of adjacent structures. Excavation below the level of a base or footing of any foundation or retaining wall is prohibited unless a support system, such as underpinning, is provided; the excavation is in stable rock; or a registered engineer determines that the structure is sufficiently removed from the excavation and the excavation will not pose a hazard to employees. The standard prohibits excavations under sidewalks unless an appropriately designed support system is provided.

Installation and Removal. The standard provides procedures for the protection of employees during the installation and removal of protective systems. The employer is also responsible for the safe condition of materials and equipment used for protective systems.

Materials and Equipment. The employer must ensure that materials and equipment are free from damage or defects, are used and maintained according to manufacturer’s specifications, and are periodically inspected by a competent person. Unsafe materials and equipment must be removed from service.

Falls and Equipment. Employers must protect employees from secondary hazards by meeting the following requirements: keeping materials that might fall or roll into an excavation from the edge or install a retaining device; providing warning systems to alert operators of the edge of an excavation; removing loose soil or rock or installing barricades or their equivalent; prohibiting employees from working on faces below other workers unless adequately protected from falling equipment; and prohibiting employees under loads that are handled by lifting or digging equipment.

Water Accumulation. The standard prohibits employees from working in excavations where water has accumulated unless adequate protection has been taken. Water removal equipment

must be monitored to ensure proper use. Diversion ditches or dikes must be used for prevention or drainage of water accumulation and must be inspected by a competent person after heavy rains.

Hazardous Atmospheres. The standard requires that a competent person must test excavations greater than four feet in depth or ones where oxygen deficiency or a hazardous atmosphere exist, before an employee can enter the excavation. If hazardous conditions exist, personal protective equipment must be provided and the conditions must be reduced to acceptable levels and periodically monitored. Emergency equipment must be provided, readily available, and attended. Harnesses and lifelines are required for employees entering bell-bottom pier holes and similar deep and confining excavation. An observer must be present to ensure that the lifeline is working properly and to maintain communication with the employee.

Access and Egress. The standard requires the employer to provide safe access and egress to all excavations. For trenches four feet or deeper, the standard requires adequate means of exit, such as ladders, steps, and ramps, at 25 foot intervals. If structural ramps are used by employees, a competent person must design them, or, if for vehicle use, the competent person must be qualified in structural design.

2. Industry Profile, Trends, and Issues

This chapter characterizes the industry sectors affected by the Excavations Standard and how they have changed since the standard's revision in 1989. Section 2.1 first provides background information on trenching and excavation activities and when they are necessary. Section 2.2 then identifies affected industry sectors. Section 2.3 characterizes the economic performance of these sectors since 1989. Finally, Section 2.4 discusses technological advances since 1989.

2.1 Background

Most types of construction require some excavation or trenching work for foundations, footings, or utilities. Excavations are necessary for foundations and footings as part of both building and non-building construction projects.[11] Trenches are narrow excavations and are necessary for installation or repair of water and sewer pipes, gas lines, electrical conduit, or other underground conduits or cables.

Installation of utilities accounts for the majority of trenching activities. The trenches for sewer lines and water lines present the greatest concern for cave-ins because of the depth of these excavations. Sewer lines are typically installed at depths of eight to 15 feet, with some installations as deep as 40 feet. Water lines are typically installed at depths of four to five feet, with some deeper installations in colder climates to prevent freezing. Gas lines, electric, telephone, and other conduits and cables tend to be placed in shallow trenches of about two feet deep.

Most new building construction projects require excavation for foundations and basements. The scale of these excavations ranges from basements for single family homes to city block excavations for major urban buildings. Heavy construction projects, such as for highways, bridges, dams, and sewage treatment plants, also require excavation work. Excavations for these types of projects vary widely in their size.

2.2 Industry Sectors Affected by the Standard

This section identifies and discusses the industry sectors affected by the Excavations Standard in terms of the Standard Industrial Classification (SIC) system.[12]

Affected Sectors in the Construction Industry

The vast majority of excavation and trenching work is performed by the construction industry. Firms that engage in excavation and trenching operations are primarily construction contractors. These firms are classified as general building contractors (SIC group 15), heavy

[11] Construction work is frequently divided into building construction and non-building construction. Both types of construction require excavations and trenches. Excavation activities for non-building construction projects, such as for highways, tend to be of a larger scale than for building construction projects.

[12] Although the North American Industrial Classification System (NAICS) has replaced SIC codes in the last few years, this study references the SIC system so that comparisons can be made spanning the entire time period of interest. Information on the construction industry is available through 1998 using the SIC system. See Appendix III for a crosswalk between the SIC codes that are the focus of this chapter and their corresponding NAICS codes.

construction contractors (SIC group 16), or special trade contractors (SIC group 17). Other industries, however, may utilize their own construction crews for trenching or excavation projects. For example, electric and gas utilities may use their own labor force for the trenching required for installation of pipes or cables. Public employees, primarily municipal public works departments, also engage in trenching or excavation projects. Exhibit 2-1 lists the four-digit SIC code industries that account for the bulk of trenching and excavation work.

Building construction requires two types of excavations: an excavation for the foundation and trenches for water, sewer, and other utility hookups. Building excavations are generally dug either by building contractors (SIC group 15) themselves, or by excavation contractors (SIC group 1794). Utility hookups are commonly performed by plumbing contractors (SIC 1711).

Exhibit 2-1
Relevant Construction Industry SIC Codes (15, 16, and 17)

1521	General Contractors-Single-Family Houses
1522	General Contractors-Residential Construction not elsewhere classified
1531	Operative builders
1541	General Contractors-Industrial Buildings and Warehouses
1542	General Contractors-Nonresidential Buildings, Other than Industrial Buildings and Warehouses
1611	Highway and Street Construction, Except Elevated Highways
1622	Bridge, Tunnel, and Elevated Highway Construction
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction
1629	Heavy Construction, NEC
1711	Plumbing, Heating, and Air-Conditioning
1721	Painting and paper hanging
1731	Electrical Work
1741	Masonry and other stonework
1751	Carpentry work
1761	Roofing, siding, and sheet metal work
1771	Concrete Work
1781	Water well drilling
1791	Structural steel erection
1794	Excavation Work
1795	Wrecking and demolition work
1799	Special Trade Contractors, NEC

Excavations for non-building projects include trenches for sewers, water mains, pipelines, and highway drainage systems. Trenching work is done primarily by so-called "utility contractors" (SIC 1623). Other heavy construction contractors as well as some special trade contractors (primarily 1794, excavation contractors, and 1711, plumbing contractors) also do utility work. Excavations for other types of non-building projects are usually performed by heavy construction general contractors (SIC group 16), or by excavation contractors (SIC 1794). Some special purpose excavations such as for outdoor swimming pools are done by contractors classified in SIC 1799 (Special Trade Contractors, N.E.C.).

Affected Non-Construction Industry Sectors

A number of industry sectors outside of the construction industry also conduct trenching and excavation activities on occasion. Exhibit 2-2 lists the SIC code and industry description for non-construction industries that are believed to engage in some excavation and trenching activities and are covered by the Standard.

Exhibit 2-2
Non-Construction Industry SIC Codes Conducting Some Excavation Activity

0781	Landscape Counseling and Planning
0782	Lawn and Garden Services
1081	Metal Mining Services
1311	Crude Petroleum and Natural Gas
4813	Telephone Communications, Except Radiotelephone
4911	Electric Services
4924	Natural Gas Distribution
4925	Mixed, Manufactured, or Liquefied Petroleum Gas Production and/or Distribution
4931	Electric and Other Services Combined
4932	Gas and Other Services Combined
4935	N/A
4941	Water Supply
5093	Scrap and Waste Materials
7353	Heavy Construction Equipment Rental and Leasing
7389	Business Services, NEC
7699	Repair Shops and Related Services, NEC
8221	Colleges, Universities, and Professional Schools
8222	Junior Colleges and Technical Institutes
8711	Engineering Services
8713	Surveying Services
9199	General Government, NEC
9511	Air and Water Resource and Solid Waste Management
9512	Land, Mineral, Wildlife, and Forest Conservation
9621	Regulation and Administration of Transportation Programs
9631	Regulation and Administration of Communications, Electric, Gas, and Other Utilities

Source: ICF analysis of IMIS Database. See Chapter 3.

Sectors Most Affected by Standard

Although numerous construction industry sectors and non-construction industry sectors are affected by the standard, this study focuses primarily on 12 sectors within the construction industry that collectively account for approximately 89 percent of excavation and trenching fatalities between 1990 and 2000 (as discussed in Chapter 3).

- 1521: General Contractors – Single-Family Houses
- 1542: General Contractors – Nonresidential Buildings, Other than Industrial Buildings and Warehouses
- 1611: Highways and Street Construction, Except Elevated Highways
- 1622: Bridge, Tunnel, and Elevated Highway Construction
- 1623: Water, Sewer, Pipeline, and Communications and Power Line Construction
- 1629: Heavy Construction, NEC
- 1711: Plumbing, Heating, and Air-Conditioning
- 1731: Electrical Work
- 1771: Concrete Work
- 1794: Excavation Work
- 1795: Wrecking and demolition work
- 1799: Special Trade Contractors, NEC

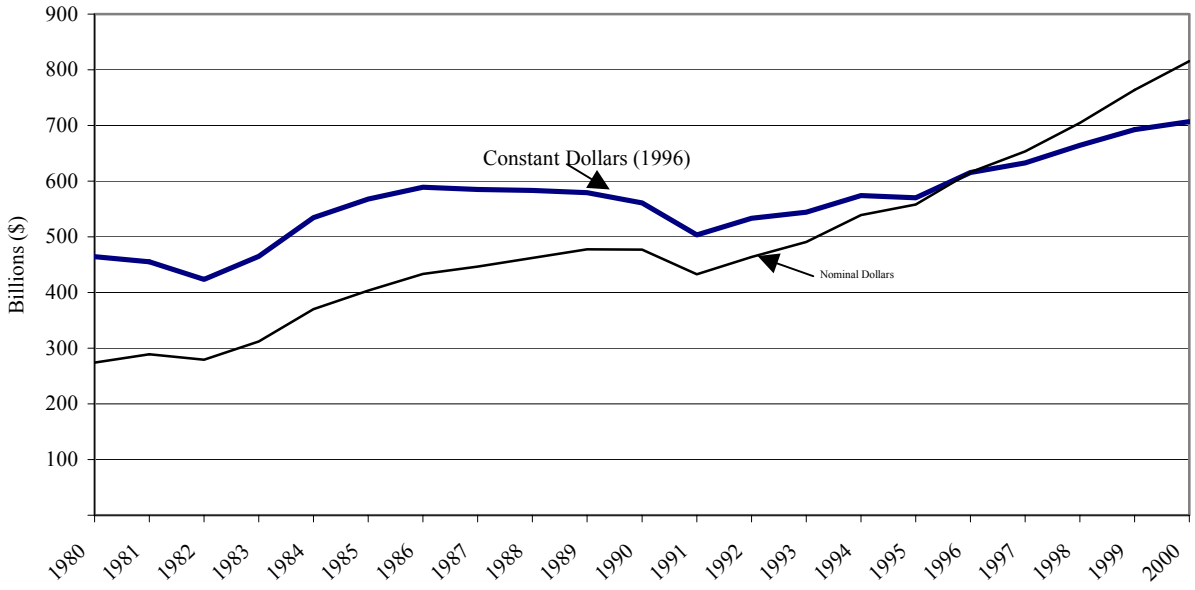
The remaining construction and all non-construction SIC codes are excluded from the analysis because they engage in excavation and trenching on only an occasional basis. Because excavation and trenching activities are such a small portion of the activities of other industry sectors, it could be misleading to include them in the analysis, and it would be hard to evaluate trends and estimate economic impacts attributable to the standard.

2.3 Economic Performance of Industry Sectors

Available statistics do not permit the direct measurement of excavation and trenching activities. Nevertheless, growth in these activities since the Excavations Standard was revised in 1989 can be surmised based on the following:

- The construction industry as a whole has grown during the past two decades. Overall, the value of construction put in place in the United States has risen between 1980 and 2000, both in constant and nominal terms (see Exhibit 2-3). In nominal dollars, the value of the construction industry has risen from less than $300 billion in 1980 to over $800 billion in 2000, while the value (in 1996 dollars) has risen from just under $500 billion in 1980 to approximately $700 billion in 2000.

Exhibit 2-3
Value of Construction Put in Place in the U.S. (1980-2000)



Source: "Annual Value of Construction Put in Place in the United States," U.S. Census Bureau. http://www.census.gov/const/C30/tab100.txt

- The number of firms conducting excavation and trenching activities has grown since the revision of the Excavations Standard.
- As measured by the Census Bureau, the number of employees in the 12 most affected industry sectors has increased by 23 percent, from 3,037,872 employees in 1990 to 3,741,386 employees in 1997.
- The total number of firms in the 12 most affected industries has increased 51 percent from 292,996 in 1989 to 443,686 in 1998.
- The number of firms in individual sectors increased for 11 of the 12 SIC codes (The exception, SIC 1622, is discussed in greater detail in Section 2.3.2.).
- Exhibit 2-4 presents the number of firms and employees by SIC code for the 12 construction SIC codes of interest.

Exhibit 2-4
Number of Firms and Employees in Selected Construction Industry SIC Codes

SIC	Number of Firms			Number of Employees		
	1989	1998	Change	1990	1997	Change
1521	56,532	136,912	142%	282,172	476,363	69%
1542	18,299	30,309	66%	375,184	446,056	19%
1611	8,836	10,707	21%	213,172	229,796	8%
1622	911	881	-3%	39,454	36,559	-7%
1623	8,074	10,774	33%	170,830	220,606	29%
1629	10,730	14,512	35%	274,805	281,322	2%
1711	73,459	87,654	19%	644,513	790,052	23%
1731	53,761	65,093	21%	528,264	646,860	22%
1771	22,225	30,710	38%	198,640	244,632	23%
1794	16,198	23,210	43%	101,298	112,025	11%
1795	845	1,336	58%	11,993	17,737	48%
1799	23,126	31,588	37%	197,547	239,378	21%
Total	292,996	443,686	51%	3,037,872	3,741,386	23%

Source: 1989 Figures: "Data by Enterprise," U.S. Census Bureau; 1998 Figures: Small Business Administration (SBA) Office of Advocacy information obtained from the U.S. Census Bureau; Percent Change: ICF analysis of Census Bureau and SBA information.

2.4 Developments in Technology

Traditional open-cut trenching methods require the use of protective systems, such as shoring and trench boxes, to prevent cave-ins. There has been incremental refinement in these manufactured systems since the enactment of the revised standard in 1989. For example, shoring has become less expensive, lighter, and more maneuverable. As manufactured systems have improved, the use of site-constructed timber shoring systems has declined.

The most significant technological development, however, has been the emergence of "trenchless technologies." This term applies to a wide range of construction methods used to install or repair pipes and cables without traditional open-cut trenching operations.[13] As discussed in more detail below, these methods typically involve some type of horizontal drilling, tunneling, or ramming. While open-cut trenching methods still predominate, the use of trenchless technologies has increased steadily since 1989, particularly in more highly-developed areas.

[13] Some amount of open excavation may be required with these technologies (e.g., to provide an underground starting point for the technology), but the extent of this open excavation is usually relatively small.

Trenchless operations substantially reduce the size of the excavation required at a particular job, thereby reducing the risk of killing or injuring workers or the public in construction-related accidents. Trenchless methods cost more than open-cut methods for most jobs, but they can be quite cost-effective for some jobs, particularly when the costs of disrupted activities (e.g., routine commerce) are considered, or when open-cut trenches would be difficult or costly to implement. For example, digging an open trench in a congested urban area can be expensive because a crew typically must dig around existing utilities and protect adjacent pavement and structures from collapse. Additionally, sidewalks, pavement, bricks, sod, and other surfaces must be repaired or replaced after the trench is closed. Most of the direct costs of the trenching operations are borne by the utility, but the community must bear the cost of disruption, delay, or damage – including traffic disturbances and delays, lost revenue to businesses, and lost tax dollars to government. Trenchless methods, by minimizing disruption, may reduce total costs in such instances.

Among the more common trenchless methods are the following:

- *Auger boring,* one of the oldest trenchless methods, is still widely used for short distances and small changes in grade (e.g., under highways or railroad tracks). Auger boring works by using a powerful machine to drill through the earth, installing sections of pipe as the bore progresses and carries spoil out of the hole. Auger boring machines are not equipped with guidance systems, but are capable of cutting through hard rock and are relatively low-cost.

- *Horizontal Directional Drilling (HDD)* works by using a rotating drill to break the ground, while another piece of equipment is used to enlarge the hole. At the surface, steering equipment is used to install pipes, conduits, or cables. Location, depth, and position are also monitored on the surface using highly accurate electronic tracking equipment. HDD equipment is generally used for installations where larger and longer piping is required, and for replacing water lines in urban and residential areas.

- *Pipe ramming* uses pneumatic piercing tools and an air compressor to pound equipment into the ground. The material that is being installed is either pulled behind the equipment or is pulled through the completed hole. Soil in the casing is generally removed with compressed air or water. Most of the pneumatic tools cannot be steered, but some models use radio transmitters to track progress with an electronic locator. This method is commonly used to drill under sidewalks and driveways.

- *Pipe bursting* is the most commonly used trenchless method for the replacement of existing pipes. The equipment drives through a section of existing pipe, fragmenting the pipe with a hammering action. Replacement pipe, attached to the rear of the equipment, is pulled into place using a cable, chain, or rod that is attached to the pulling device. Pipe bursting is used when the existing pipe is brittle cast iron, vitrified clay, unreinforced concrete, asbestos cement, or plastic. This method is limited to smaller pipes, although the replacement pipe can be larger than the existing pipe.

- *Microtunneling* begins by creating a hole using a cutting shield, which forms a continuous tunnel lining. Laser-guided, remote-controlled equipment pushes

sections of pipe into the hole and through the ground while soils are removed with augers. Equipment and mobilization costs are high, making this the most expensive trenchless procedure. Microtunneling is most common in Germany and Japan.

- *Vibratory plowing* (the use of a vibratory plow), either a walk behind or ride-on machine, pulls a vertical plow blade through the ground, cutting through soil and vegetation with a minimum of surface disturbance, typically for burying wire, cable, fiber optics, conduit, and water or gas pipe. The ground opens around the plow and closes behind it or leaves a small slit to be back filled. A hydraulic motor driving rotating weights on the plow causes the blade to vibrate as it is pulled through the earth. Plow configuration is matched to the product to be buried. Vibration and ground speed are controlled by the operator to maximize production in various conditions. Some plows pull the material being buried through the earth behind the blade with a special attachment. Others feed the material into the ground through a chute at the back of the blade.

Trenchless methods have some disadvantages, including their own risks to workers and the public. Most notably, operators cannot always see what lies in the way and, consequently, underground utility lines may be cut. Such accidents can result in injuries or deaths depending on the circumstances, in addition to the added expense of repairing the damaged lines. Another risk is that, after construction, unseen voids may be left behind, which could lead to a collapse that could cause physical injuries or property damage.

Several related technological advances have improved the quality and decreased the cost of trenchless methods. These include newer, more precise guidance electronics; new pipe materials (such as high-density polyethylene [HDPE]) that are tough but flexible; cured-in-place pipe lining systems; and new pipe bursting tools. In addition, a variety of new technologies have been developed for repairing pipes. Robotic systems, for example, can make point repairs using special attachments for repairing leaks. Also, more effective materials are available to seal pipe repairs, such as acrylmide, acrylate, urethane gel, and polyurethane foam.

3. Fatalities

This chapter estimates the number and rate of excavation-related fatalities to help evaluate the effectiveness of the Excavations Standard with respect to preventing fatalities. Except where noted, all fatality data have been drawn from OSHA's Integrated Management Information System (IMIS) database.[14] The analysis of fatalities begins at the national level before considering individual industries and causes (i.e., types of accidents).

3.1 National Fatalities and Trends

During the eleven-year period 1990-2000, accidents involving excavations resulted in an annual average of 70 fatalities, or a total of 771 for the period as a whole. The actual number of fatalities each year varied within the range of 59-81. Exhibit 3-1 reports the number of fatalities occurring in each year.

Exhibit 3-1
Number of Trenching and Excavation Fatalities

Year	Fatalities
1990	76
1991	72
1992	72
1993	59
1994	74
1995	61
1996	62
1997	72
1998	67
1999	81
2000	75
Total	771
Average	70

Source: ICF analysis of IMIS database.

In 1987, prior to OSHA's 1989 revision of the Excavations Standard, OSHA estimated the annual average number of excavation-related fatalities at 90.[15] Relative to this figure, the post-

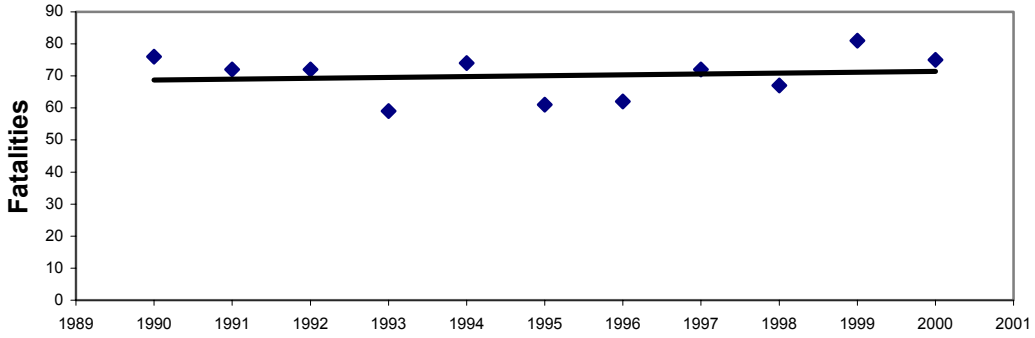
[14] *Integrated Management Information System (IMIS),* U.S. Department of Labor, Occupational Safety and Health Administration, last updated August 5, 2000. The extraction covered all accidents and associated violations pertaining to reported excavation-related fatalities, including trenching fatalities, for the period 1990-2000. As OSHA does not require reporting of accidents causing three or fewer injuries, available data on injuries are limited and, consequently, this study does not examine the number or rate of excavation-related injuries.

[15] Economic Impact Analysis of the Proposed Revision to OSHA Subpart P Standard (§1926.650-652) Governing Trenching and Excavation Work, prepared for OSHA's Office of Regulatory Analysis by Eastern Research Group, Inc. (ERG), May 19, 1987, discussed at 54 FR 45950 (October 31, 1989). There were no complete national data sets available at the time OSHA was preparing the final Excavations standard on the number of excavation fatalities. Thus, OSHA averaged two approaches to develop the 90 excavation fatality estimate. The first approach combined average California and Texas excavation cave-in deaths and then adjusted this figure to reach an estimate of the total excavation

rule estimate of 70 represents a 22% reduction in the number of fatalities related to excavation since the promulgation of OSHA's revised standard. Moreover, this 22% reduction has been achieved as construction activity increased by 20% in real terms over this period.

Although the number of excavation-related fatalities per year remained fairly level during the 1990-2000 period, as shown in Exhibit 3-2, these data do not reflect the increase in annual construction activity that occurred during the same period. To gauge fatalities relative to the level of construction, the study divided each year's number of fatalities by the value of construction put in place for the same year, [16] thereby yielding a fatality rate. The fatality rate did decline over the period, as shown in Exhibit 3-3. In other words, although the annual number of fatalities remained fairly constant, the fatality rate decreased due to an increase in construction activity.

Exhibit 3-2
Number of Fatalities, 1990-2000

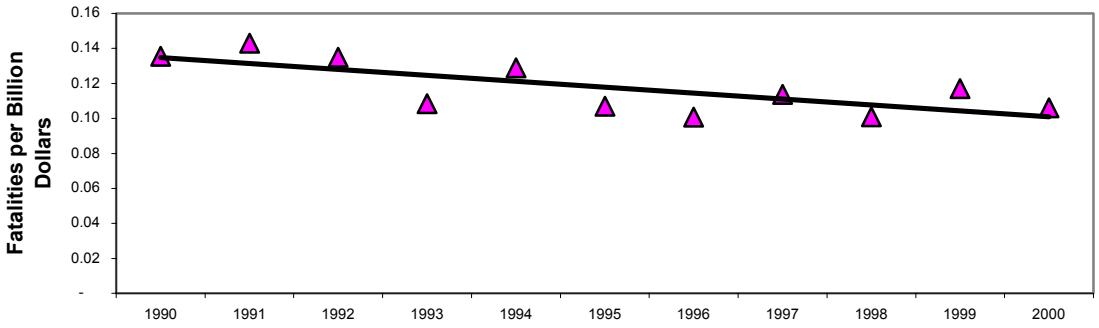


Source: ICF analysis of IMIS database.

deaths in these states (a combined state average). OSHA then extrapolated this number to the entire country (based on national construction receipts) to come up with an estimate of 83 excavation deaths per year. The second approach averaged the 3 years of OSHA Fatality/Catastrophe reports available for excavation deaths in Federal OSHA states and then extrapolated that data to the entire country (including an adjustment for growth in the construction industry), resulting in an estimate of 97 excavation deaths per year. OSHA averaged these two estimates to come up with the estimate in the proposed rule of 90 fatalities a year. There is some uncertainty in this estimate given the data available and the extrapolations necessary.

[16] "Annual Value of Construction Put in Place in the United States 1985-2001," *Economic Indicators,* U.S. Census Bureau. http://www.census.gov/pub/const/C30/c30_hist.html. These particular data (stated in constant 1996 dollars) address construction in general, and not just excavation and trenching. Thus, the resulting rate is lower than would result if excavation-specific data had been used. Nevertheless, the trend discussed above remains valid under the logical assumption that the value of excavation activity as a percentage of construction activity remains fairly constant.

Exhibit 3-3
National Fatalities per Billion Dollars of Construction Value Put in Place, 1990-2000



Source: ICF analysis of IMIS database and economic census data.

3.2 Fatalities by Industry

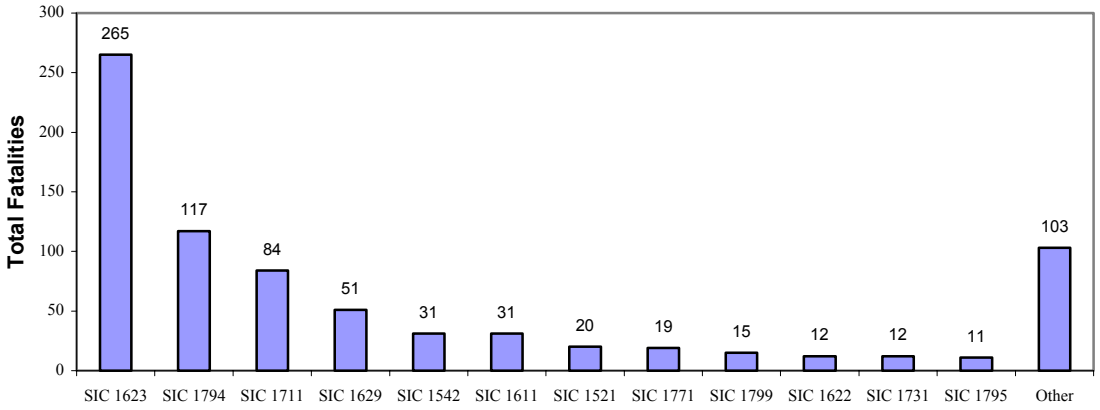
The 1990-2000 data show that excavation fatalities occur in numerous industries but are primarily concentrated in a relatively few. Twelve industries, all of which fall within the construction sector, account for approximately 89 percent of excavation-related fatalities. These industries include the following SIC codes (listed in order of the greatest to the least total number of fatalities over the 11-year period):[17]

- 1623: Water, Sewer, Pipeline, Communications, and Power Line
- 1794: Excavation Work
- 1711: Plumbing, Heating, and Air Conditioning
- 1629: Heavy Construction
- 1542: General Contractors, Non-Residential, Non-Industrial
- 1611: Highway and Street Construction
- 1521: General Contractors, Single Family Homes
- 1771: Concrete Work
- 1799: Special Trade Contractors
- 1622: Bridge, Tunnel, and Elevated Highway
- 1731: Electrical Work
- 1795: Wrecking and Demolition Work

Exhibit 3-4 shows the distribution of fatalities across these 12 industries as well as the "other" remaining industries. As illustrated in the graph, SIC 1623 (Water, Sewer, Pipeline, Communications, and Power Line) reports the highest number of excavation-related fatalities, at more than twice that of the industry with the second highest total fatalities (SIC 1794, Excavation Work). SIC 1623 conducts a substantial amount of trenching activity.

[17] Appendix A presents fatality data spanning all industries that reported excavation-related fatalities.

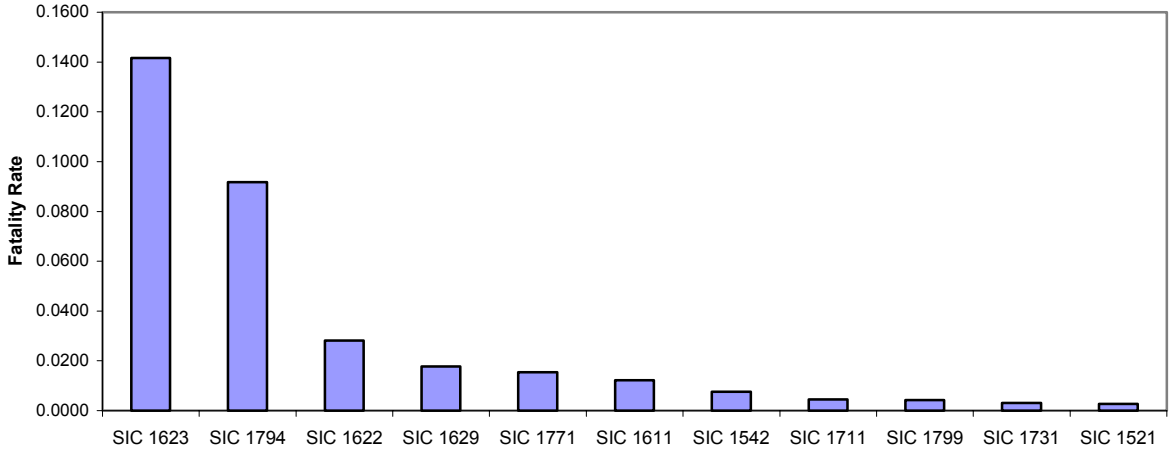
Exhibit 3-4
Fatalities by Industry, 1990-2000



Source: ICF analysis of IMIS database.

The ranking of these industries changes somewhat when based on the fatality rate per 1,000 employees working within the designated SIC code.[18] Nevertheless, as shown in Exhibit 3-5, SIC 1623 continues to stand out with the number of fatalities substantially higher than the other key industries.

Exhibit 3-5
Average Fatality Rate by SIC per 1,000 Employees, 1990-1997

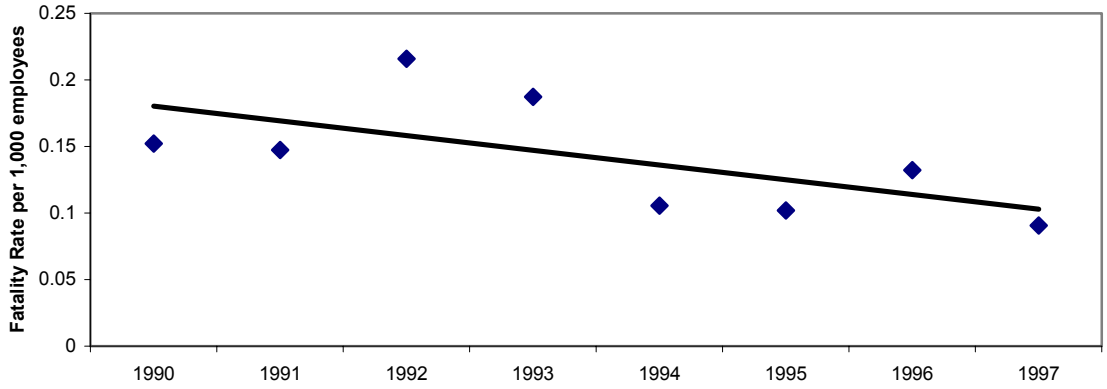


Source: ICF analysis of IMIS database and economic census data.

As shown in Exhibit 3-6, however, the fatality rate for SIC 1623 has a decreasing trend from 1990-1997 (which is not the case for SIC 1794 and some of the other industries).

[18] Employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses 1990-1997, www.sba.gov/advo/sstats/data.html, obtained February 27, 2002.

Exhibit 3-6
Fatality Rate for SIC Code 1623, 1990-1997
(Water, Sewer, Pipeline, Communications, and Power Line)

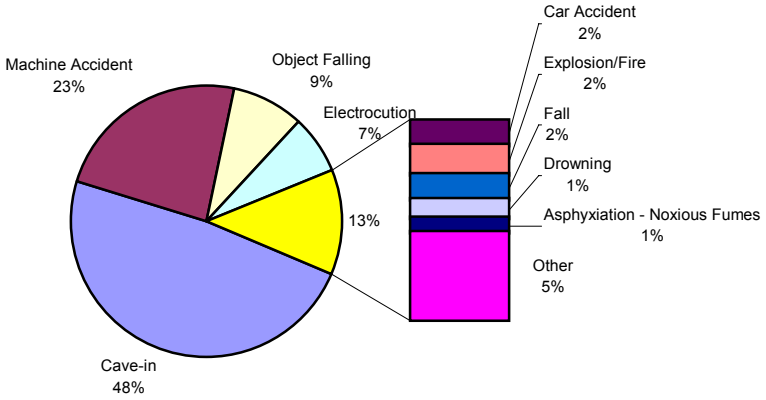


Source: ICF analysis of IMIS database and economic census data.

3.3 Fatalities by Cause of Death

Excavation fatalities may result from a variety of accident types, including cave-ins, machine accidents, falling objects, electrocution, car accidents, explosions or fires, falls, drowning, and asphyxiation due to noxious fumes. Exhibit 3-7 shows the relative proportion for each cause of death for the 1990-2000 period. As illustrated in the graph, approximately half of all excavation-related fatalities (approximately 48 percent) result from cave-ins.

Exhibit 3-7
Distribution of Fatalities by Cause of Death, 1990-2000



Source: ICF analysis of IMIS database.

4. Compliance with the Standard

This chapter evaluates compliance with the Excavations Standard at 29 CFR, Subpart P, §§1926.650-652 and appendices A-F, by evaluating violation data contained in OSHA's Integrated Management Information System (IMIS) database.[19] OSHA does not require employers to report an accident unless three or more employees have been hospitalized, an amputation has occurred, or a fatality has occurred. Therefore, only limited data are available on accidents that do not involve fatalities. Consequently, this study examines compliance by looking at accidents involving fatalities.[20]

Excavation accident reports and news accounts suggest, nearly universally, that compliance with existing safety standards would have prevented the accidents being described.[21] This hypothesis is largely supported by violation data contained in IMIS. These data indicate that OSHA found violations of the Excavations Standard in approximately 80 percent of the 771 cases of excavation-related fatalities that occurred between 1990 and 2000. While the reported data did not specify any violations for almost 20 percent of the reported fatalities, OSHA does not believe this implies full compliance with the Excavations Standard in these cases.[22]

The analysis of compliance first considers the types of violations associated with fatalities. It then reviews related information on monetary penalties associated with the violations.

4.1 Compliance Violations

This study found 1,149 violations associated with the 771 excavation fatalities reported during 1990-2000. (Many fatalities are associated with multiple violations.) Of these 1,149 violations, 565 violations (approximately 50 percent) are reported to have been a contributing factor to the corresponding fatal accident (see Exhibit 4-1).[23] In fact, a key finding of this study is that OSHA has identified one or more compliance violations as a contributing factor in over 73 percent of the 771 fatalities examined. As explained above and in footnote 22, OSHA believes the true percentage is even higher. It seems reasonable to conclude, therefore, that the current standard, when met, is protective of worker safety. This does not imply, however, that

[19] *Integrated Management Information System (IMIS),* U.S. Department of Labor, Occupational Safety and Health Administration, last updated August 5, 2000. The extraction covered all accidents and associated violations pertaining to reported excavation-related fatalities, including trenching fatalities, for the period 1990-2000.

[20] As a result, this study is unable to address overall compliance levels.

[21] See, for example, "Preventing Deaths and Injuries from Cave-Ins," NIOSH Alert: July 1995, DHHS (NIOSH) Publication No. 85-110; and, "Improper Excavation Procedures Contribute to Death of Construction Worker," OSHA Trade News Release, July 2002.

[22] For example, OSHA believes that some violations may have occurred but not been identified or reported. Analysis of the fatalities for which violations are not reported in IMIS shows that approximately one third (32 percent) involved cave-ins, and many of these cases suggested possible non-compliance with the standard. Non-compliance with the Excavations Standard may have been less of a factor in non-cave-in fatalities at excavation sites, such as fatalities associated with machine accidents (46 percent) or electrocutions (5 percent). Remaining fatalities were due to other or unknown causes.

[23] The IMIS database reports these violations as "related to" a given fatality, which means that the cited violation is a contributing factor to the fatality. Some fatalities reported in the IMIS database cite violations without identifying any as contributing factors. This means that it was not clear whether the violations contributed to the fatality.

the standard need not be modified, as it may be possible to revise the standard in a manner that would increase compliance.

Exhibit 4-1
Violations and Fatalities

Fatalities	771
Fatalities with reported violations	624
Violations associated with fatalities	1,149
Violations identified as contributing to fatalities	565

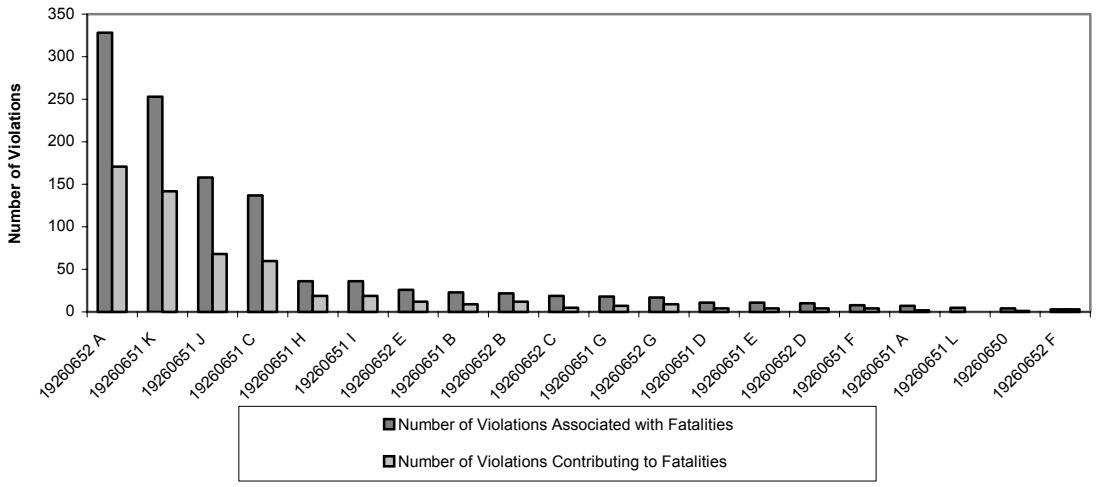
To help evaluate the level of compliance, and the importance of compliance with individual provisions of the Excavations Standard, Exhibit 4-2 summarizes and classifies each provision in the standard with respect to the number of violations associated with, and contributing to, fatalities during the 1990-2000 period. Exhibit 4-3 summarizes this information graphically.

Exhibit 4-2
Fatality-Related Violations of the Excavations Standard, 1990-2000

Section and Description		Violations Associated with Fatalities	Violations Contributing to Fatalities
1926.650 – Scope, application, and definitions		4	1
1926.651 – Specific Excavation Requirements			
(a)	Surface encumbrances	7	2
(b)	Underground installations	23	9
(c)	Access and egress	137	60
(d)	Exposure to vehicular traffic	11	4
(e)	Exposure to falling loads	11	4
(f)	Warning system for mobile equipment	8	4
(g)	Hazardous atmospheres	18	7
(h)	Protection from hazards associated with water accumulation	36	19
(i)	Stability of adjacent structures	36	19
(j)	Protection of employees from loose rock or soil	158	68
(k)	Inspections	253	142
(l)	Walkways and guardrails	5	0
1926.652 – Requirements for Protective Systems			
(a)	Protection of employees in excavations	328	171
(b)	Design of sloping and benching systems	22	12
(c)	Design of support systems, shield systems, and other protective systems	19	5
(d)	Materials and equipment	10	4
(e)	Installation and removal of support	26	12
(f)	Sloping and benching systems	3	3
(g)	Shield systems	17	9

* The preceding table omits violations reported in IMIS if attributed to a subparagraph of the standard which can not be identified with certainty because of a typographical error in the IMIS data.

Exhibit 4-3
Fatality-Related Violations of the Excavation Standard, 1990-2000



As can be seen from Exhibit 4-3, the sections of the standard that account for the most violations in the dataset include sections 1926.652(a), 1926.651(k), 1926.651(j), and 1926.651(c). These requirements, which are stated in the adjacent text box, are quite fundamental: protect employees in excavation; inspect the site daily; protect employees from loose rock or soil; and provide access and egress. In contrast, far fewer violations occurred with respect to some of the more specific provisions of the Excavations Standard, such as design of sloping and benching systems, design of support systems and shield systems, and protection from hazardous atmospheres. The fact that most violations occur with respect to the standard's basic requirements (as opposed to its more specific provisions) suggests that fatalities may result more from a failure to understand the risks or the failure to apply any safety systems than from a failure to install safety systems correctly.

4.2 Penalties

The average monetary penalty reported by section of the standard is shown in Exhibit 4-4. The amount of the initial penalty may be reduced (to the amount of the "current penalty") if the violator contests the violation or the associated penalty. Note that zero dollar penalties are included in the calculation of the averages.

Since 1987, OSHA has had in place a special emphasis program on trenching and excavation. For example, OSHA IMIS (Internal Management Information System) data identify 1,382 inspections of excavating contractors during 2000. These inspections include both Federal and State Plan inspections in SIC 1794 (Excavation Work), the SIC with the highest concentration of excavation work. These inspections resulted in 2,205 citations that totaled $1,907,593 in penalties. Four hundred sixty-five (34%) of these inspections found no violations.

Most Common Fatality-Related Violations, 1990-2000

1926.652(a): Protection of employees in excavations.
(1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

1926.651(k): Inspections.
(1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
(2) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

1926.651(j): Protection of employees from loose rock or soil.
(1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.
(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

1926.65(c): Access and egress.
(1) Structural ramps. (i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

Exhibit 4-4
Average Monetary Penalties Associated with the Excavations Standard, 1990-2001

Standard	*Average Initial Penalty*	*Average Current Penalty*
19260650	$ 540	$ 340
19260651 A	$ 12,607	$ 2,107
19260651 B	$ 8,900	$ 7,778
19260651 C	$ 4,813	$ 3,104
19260651 D	$ 1,183	$ 487
19260651 E	$ 8,867	$ 1,798
19260651 F	$ 2,588	$ 2,323
19260651 G	$ 2,101	$ 1,200
19260651 H	$ 12,259	$ 4,907
19260651 I	$ 4,247	$ 3,232
19260651 J	$ 6,545	$ 4,354
19260651 K	$ 5,685	$ 3,804
19260651 L	$ 829	$ 797
19260652 A	$ 15,014	$ 8,496
19260652 B	$ 8,782	$ 5,493
19260652 C	$ 9,628	$ 8,096
19260652 D	$ 7,273	$ 7,075
19260652 E	$ 3,259	$ 1,488
19260652 F	$ 1,867	$ 933
19260652 G	$ 12,956	$ 12,057
19260652 K	$ 4,833	$ 2,833

This table omits penalties reported in IMIS if attributed to a subparagraph of the standard which can not be identified with certainty because of a typographical error in the IMIS data.

5. Cost Analysis

The objective of the "lookback" cost analysis is to assess the relative increase or decrease in the cost of required safety measures for excavation since 1990. If costs have increased substantially, then impacts on small businesses are likely to have increased over the period as well. Conversely, if safety-related costs have stayed constant or decreased in real terms, then impacts are not likely to have increased. The analysis and key findings are summarized in Section 5.1. Section 5.2 presents additional details on the comparison of costs.

5.1 Overview and Key Findings

The standard requires that walls and faces of all excavations or trenches should be guarded by a shoring system, safe sloping, or equivalent means of protection such as trench shields or trench boxes. This study estimates the 2001 cost of using the four most common types of protective systems: sloping, trench boxes, aluminum shoring, and timber shoring.[24] It then compares the current cost to the corresponding cost (inflation-adjusted) at the time the standard became effective in 1990.[25] These findings are supplemented by research conducted on trends in the use of various types of safety equipment, including telephone discussions with members of government, trade associations, and vendors serving the trenching/excavation market.

The analysis finds that trench boxes, aluminum shoring, and the use of sloping were less expensive in 2001 (by about 10% in real dollars) than they were in 1990. Timber shoring may be more or less expensive today than previously, depending on the type and size of timbers used. In any event, however, timber shoring is used less frequently today than a decade ago.[26] Newer types of protective systems, including the various "trenchless" technologies, slide rail systems, and modular trench boxes, are being used with increasing frequency. Although the costs of these newer systems have not been examined for this study, it is reasonable to assume that each enjoys a net cost advantage over the older methods, at least in those situations where the newer systems are used.

The study concludes, therefore, that the protective systems available in 1990 (when the Excavations Standard was enacted) remain available today and, in fact, cost less in 2001 in real dollars. Furthermore, the entry into the marketplace of new types of protective systems has increased available options and likely has reduced the cost of meeting the standard.

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[24] The analysis does not attempt to calculate the total cost of the standard (e.g., by estimating the cost of every provision in the rule) as would be required in a regulatory impact analysis for a new rule.

[25] "Current" costs are based on 2001 cost data and occasionally from 2002 vendor quotes. Costs from 1990 have been converted to current (2001) dollars using the applicable implicit price deflators for the U.S. gross domestic product.

[26] Several sources indicated that trench boxes and aluminum hydraulic shores are the most common ways of meeting the standard, followed by sloping, and then timber shoring. Timber shoring tends to be used as a last resort, because of the relatively high cost of the timbers, the difficulty in finding larger timbers, and the possibility of occupational injuries to workers handling the heavy timbers.

5.2 Cost Analysis of Protective Systems

This section details the cost analysis of the four most common types of protective systems: sloping, trench boxes, aluminum shoring, and timber shoring. The analysis estimates and compares the current cost of each type of system to what the system cost when the Excavations Standard became effective in 1990. This approach implicitly assumes that firms would employ the same type of protective system today as a decade ago. In reality, as the relative costs of systems change, firms will tend to substitute the less expensive systems for the more costly ones. In addition, the analysis does not explicitly account for new technologies (e.g., trenchless technologies) that have, in fact, gained a share of the excavation safety market; these new technologies would not be used if they were not, on net, the most cost-effective option available for certain jobs. For both of these reasons, cost impacts are likely to be overstated by this study.

It is not always the case that cost is the driving factor in selecting a protective system. In some cases, site-specific or job-specific conditions may limit the available choices:

- Sloping frequently is not an option for excavation or trenching work conducted in urbanized areas because roadways, sidewalks, or building foundations limit the width of the area that would need to be excavated.

- When trenches will cross existing utility lines, trench boxes often cannot be used. Some form of shoring is typically used when pre-existing utilities are an issue.

- Soil type also may prevent the selection of a particular safety measure (e.g., use of aluminum shoring is inappropriate in soils lacking internal cohesion).

- Trench boxes may be infeasible or inappropriate for use in trenches that will remain open for prolonged periods. Trench boxes typically are dragged forward to the newer, working portions of a trench while the prior section (where work has just been completed) is quickly filled (after the trench box has left that section). The trench box generally should not be moved until the particular section of the trench containing the trench box is ready to be filled. Consequently, the heavy trench box is not typically used in cases where a trench will remain open long, except where the trench is short in length.

Nevertheless, these considerations are not new, so firms facing a restricted set of options today are no different than similarly situated firms in 1990. In these situations, where there is a reduced ability to select an alternative protective system, a comparison of current costs to 1990 costs is particularly appropriate.

5.2.1 Sloping

The study analyzed the cost of digging trenches with sloped sides based on engineering cost data contained in RS Means cost guides.[27] For the years 1990 and 2001, the study reviewed

[27] Costs for 1990 are taken/derived from RS Means Heavy Construction Cost Data, 1991. Costs for 2001 are from Means Site Work and Landscape Cost Data, 2002.

the relevant guides to identify the combined equipment and labor unit cost (i.e., cost per linear foot) of digging ten different trenches. The trenches differ in slope (five different slopes, including the base case of 0:1 slope [or vertical walls]) and in width (half are 2 feet wide and half are 4 feet wide). All of the trenches have a depth of 10 feet. The analysis then restated the 1990 costs in 2001 dollars using implicit price deflators for U.S. gross domestic product (GDP).

The results of the comparison, presented in Exhibit 5-1 at the end of this chapter, show that the overall cost of trenching using sloping has decreased for all slopes and trench types. The decrease in cost per linear foot ranges from 2.3 to 5.5 percent, and reflects the net result of decreased equipment costs that are partially offset by increased labor costs.

5.2.2 Trench Boxes

The primary cost of using trench boxes consists of the cost of the trench box itself. Although there is some increase in the time required to trench using a trench box as opposed to not using any protective system, research conducted for this study indicates that the loss in productivity is not significant in most cases and, moreover, is comparable to the loss associated with using other protective systems (e.g., shoring). The study obtained trench box monthly rental costs for two different sizes of trench boxes (8 x 16 feet, and 10 x 20 feet) for 1989 and 2001 from Means cost guides.[28] The study also considered the total cost of a trenching job using each type of trench box, assuming a production rate of 90 linear feet per day (or 1800 linear feet per month).[29] As necessary, the study converted costs to 2001 dollars using implicit price deflators for GDP.

The results of the analysis show that the cost of the smaller trench box has declined by approximately 25 percent over the past decade, while the cost of the larger trench box has increased by almost 20 percent. When considered within the context of the overall trenching job, however, these changes in trench box costs prove to be almost insignificant to the cost of trenching overall. Using either size trench box, the overall cost of trenching has declined over the past decade. The size of the decrease is over 3 percent if the small trench box is used and almost 1 percent if the large trench box is used. These findings are shown in Exhibit 5-2.

5.2.3 Aluminum Shoring

The analysis assumes a typical trenching job that uses aluminum shores involves three H-type shores, as well as one pump and associated accessories for the open length of the trench. Current costs were obtained based on vendor quotes.[30] Past regulatory studies provided information on the 1987 per shore purchase cost associated with a 9 (or 9.5) feet deep, 3-foot wide trench, as well as the pump and accessories.[31] Although there is some increase in the time required to trench using aluminum shores as opposed to not using any protective system, research conducted for this study indicates that the loss in productivity is not significant in most cases and, moreover, is comparable to the loss associated with using other protective

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[28] *Ibid.* Also, RS Means Building Construction Cost Data, 1990.

[29] Based on information contained in the *Economic Impact Analysis of the Proposed Revision to OSHA Subpart P Standard (§1926.650-652) Governing Trenching and Excavation Work,* prepared by Eastern Research Group, May 19, 1987.

[30] ICF telephone discussions with trenching and shoring vendors.

[31] *Economic Impact Analysis of the Proposed Revision to OSHA Subpart P Standard (§1926.650-652) Governing Trenching and Excavation Work,* prepared by Eastern Research Group, May 19, 1987.

systems (e.g., trench boxes). As necessary, the study converted costs to 2001 dollars using implicit price deflators for GDP.

This analysis, presented in Exhibit 5-3, estimates that the cost of aluminum shore equipment has declined by approximately 10 percent in real dollars since 1987.

5.2.4 Timber Shoring

Research conducted for this study indicates that timber shoring is the most expensive method and is only used when necessary (e.g., to keep an excavation open for an extended period of time). Disadvantages of timber shoring include cost, difficulty finding larger timbers, and risk of occupational injuries to workers handling the heavy timbers. The cost of using timber shoring as a protective system depends largely on the cost of the timber shores; other costs of digging trenches have decreased since the enactment of the Excavations Standard, as discussed above. The study analyzed the cost of timber shoring based on engineering cost data contained in RS Means cost guides.[32] The study converted costs to 2001 dollars when necessary using implicit price deflators for GDP.

As shown in Exhibit 4, the real price of lumber has decreased over the last decade, with the exception of the cost of large (8 x 8) timbers. The price also can vary with the type of wood available. Therefore, in many cases it may be less expensive to use timber shoring today than in 1989, but in other cases it may currently be more expensive.

[32] Costs for 1989 are taken/derived from RS Means Building Construction Cost Data 1990. Costs for 2001 are from Means Site Work and Landscape Cost Data 2002.

Exhibit 5-1
Comparison of Sloping Costs ($ per linear foot)

Trench Size and Slope	1990 Costs			1990 Costs Adjusted to 2001 Dollars			2001 Costs			Percent Change[1]
	Equipment	Labor	Total	Equipment	Labor	Total	Equipment	Labor	Total	
2' wide, 10' deep										
Slope 0:1	$ 3.10/LF	$ 4.10 /LF	$ 7.20/LF	$ 3.95/LF	$ 5.23/LF	$ 9.18/LF	$ 3.20/LF	$ 5.70/LF	$ 8.90/LF	-3.09%
Slope 1/2:1	$ 8.60/LF	$11.10/LF	$19.70/LF	$10.97/LF	$14.16/LF	$25.13/LF	$ 8.75/LF	$15.50/LF	$24.25/LF	-3.49%
Slope 1:1	$ 14.15/LF	$17.70/LF	$31.85/LF	$18.05/LF	$22.58/LF	$40.63/LF	$14.35/LF	$24.50/LF	$38.85/LF	-4.37%
Slope 1 ½:1	$ 15.65/LF	$18.25/LF	$33.90/LF	$19.96/LF	$23.28/LF	$43.24/LF	$15.80/LF	$25.50/LF	$41.30/LF	-4.49%
Slope 2:1	$ 17.80/LF	$21.00/LF	$38.80/LF	$22.70/LF	$26.79/LF	$49.49/LF	$18.00/LF	$29.00/LF	$47.00/LF	-5.03%
4' wide, 10' deep										
Slope 0:1	$ 6.40/LF	$ 8.05/LF	$14.45/LF	$ 8.16/LF	$10.27/LF	$18.43/LF	$ 6.70/LF	$11.30/LF	$18.00/LF	-2.34%
Slope 1/2:1	$11.50/LF	$14.15/LF	$25.65/LF	$14.67/LF	$18.05/LF	$32.72/LF	$11.90/LF	$19.85/LF	$31.75/LF	-2.96%
Slope 1:1	$15.30/LF	$18.20/LF	$33.50/LF	$19.52/LF	$23.21/LF	$42.73/LF	$15.80/LF	$25.50/LF	$41.30/LF	-3.35%
Slope 1 ½:1	$18.45 /LF	$21.00/LF	$39.45/LF	$23.53/LF	$26.79/LF	$50.32/LF	$18.95/LF	$29.00/LF	$47.95/LF	-4.71%
Slope 2:1	$21.00 /LF	$23.00/LF	$44.00/LF	$26.79/LF	$29.34/LF	$56.12/LF	$21.00/LF	$32.00/LF	$53.00/LF	-5.57%

[1] Percent change calculated based on difference between shaded cells.

Exhibit 5-2
Comparison of Trenching Costs using Trench Boxes ($/month)

Cost Element	Units	1989 Costs	1990 Costs	1989-90 Cost Adjusted to 2001 Dollars	2001 Costs	Percent Change[2]
Labor to Dig Trench (4' wide, 10' deep, 0:1 slope)	$/lf		$ 8.05		$ 11.30	
Equipment to Dig Trench (4' wide, 10' deep, 0:1 slope)	$/lf		$ 6.40		$ 6.70	
Subtotal - Dig Trench	$/lf		$ 14.45	$ 18.44	$ 18.00	
Subtotal - Dig Trench[1]	$/month			$ 33,196	$ 32,400	
Trench Box (8x16)	$/month	$ 1,275		$ 1,685	$ 1,275	
TOTAL COST USING 8 x 16 BOX	$/month			**$ 34,881**	**$ 33,675**	-3.46%
Trench box (10X20)	$/month	$ 1,950		$ 2,577	$ 3,075	
TOTAL COST USING 10 x 20 BOX	$/month			**$ 35,774**	**$ 35,475**	-0.83%

1 Subtotals were converted from ($/lf) to ($/month) based on an assumed production rate of 90 ft/day and an assumed working month of 20 days/month, resulting in a conversion factor of 1,800 lf/month.

2 Percent change based on difference between shaded cells.

Exhibit 5-3
Comparison of Aluminum Shoring Equipment Costs

Cost Element	1987 Cost	1987 Adjusted Cost	Quantity	Total 1987 Adjusted Cost	2002 Cost	Quantity	Total 2002 Cost	% Change[1]
Cost per shore	$ 550.00	$ 779.11	3	$2,337.32	$ 679.00	3	$2,037.00	
Cost for Pump and Accessories	$ 475.00	$ 672.87	1	$ 672.87	$ 666.67	1	$ 666.67	
Total				$3,010.19			$2,703.67	-10.18%

(1) Percent change based on difference between shaded cells.

Exhibit 5-4
Comparison of Timber Shoring Prices

Timber Size	Units	1989 Lumber Costs	1989 Costs Adjusted to 2001 Dollars	2001 Lumber Costs	Percent Change[2]
2x6	$/MBF[1]	$ 320.00	$ 422.97	$ 392.00	-7.32%
4x6	$/MBF	$ 550.00	$ 726.98	$ 648.00	-10.86%
6x6	$/MBF	$ 640.00	$ 845.94	$ 817.00	-3.42%
8x8	$/MBF	$ 640.00	$ 845.94	$ 972.00	14.90%

(1) Dollars per thousand board feet.
(2) Percent change based on difference between shaded cells

6. Public Comments and OSHA Responses

As required by the Regulatory Flexibility Act, OSHA invited public comment on the Section 610 review of the rule by publishing a Federal Register notice requesting comments on the Excavations Standard (67 FR 54103, August 21, 2002). OSHA opened public docket S204A (now Docket No. OSHA-2007-0012) to hold this solicited information. A total of 20 commenters provided information to the docket (listed below in alphabetical order, with docket reference number):

1. Associated Builders and Contractors (ABC, Ex. 2-7)
2. American Federation of State, County and Municipal Employees (AFSCME, Ex. 3-7)
3. American Gas Association and American Public Gas Association (AGA/APGA, Ex. 4-1)
4. Associated General Contractors of America (AGC, Ex. 2-8)
5. AFL-CIO Building and Construction Trades Department (BCTD, Ex. 2-5)
6. James F. Burson, P.E. (Ex. 2-3)
7. Cedar Falls Utilities (Ex. 3-2)
8. Coastal Training Technologies (Ex. 3-1)
9. The Dotson Company, Inc. (Ex. 3-4)
10. Duininck Bros Inc. (Ex. 2-2)
11. International Brotherhood of Teamsters (IBT, Ex. 2-10)
12. Robert Kundel (Ex. 3-6)
13. Jack L. Mickle, Ph.D. (Ex. 2-13)
14. The Mosser Group (Ex. 2-1)
15. National Association of Home Builders (NAHB, Ex. 2-9, Ex. 3-8)
16. National Institute for Occupational Safety & Health (NIOSH, Ex. 2-12)
17. National Utility Contractors Association (NUCA, Ex. 2-4)
18. Pipe Line Contractors Association (PLCA, Ex. 2-11)
19. Traffic Control Plan (TCP, Ex. 3-5)
20. Trench Shoring Services (Ex. 2-6)

There was general agreement among commenters that the Excavations Standard, when complied with, helps prevent excavation and trenching accidents and helps protect worker safety. In support of this position, one commenter (NIOSH) submitted a study that found a decline in fatalities since the 1989 revision of the Excavations Standard (Suruda et al., 2002). Commenters also generally agreed that there is a continued need for the standard, particularly given that excavation and trenching fatalities continue to occur. Another widely-held view was that improving compliance rates is the key to further reductions in accidents, injuries, and fatalities.

These statements are supported by the facts found in this review. Furthermore, after reviewing the facts and comments, these statements support OSHA's conclusions for this lookback review. The annual number of trenching and excavation fatalities has declined from an estimated 90 fatalities per year prior to the enactment of the 1989 standard, to approximately 70 per year since 1990. As noted earlier, the 22% reduction was achieved as construction activity increased by 20% in real terms over this period. Therefore, in relation to increased construction activity, fatalities have been reduced by more than 40%. The real cost of protective devices such as shields has dropped, excavation activity has increased, and the number of small business engaged in excavation activities has increased. The evidence indicates that the large majority of deaths are contributed to by violations of the standard.

All this evidence as well as the comments support the view that the Excavation Standard is working to protect workers and has not caused negative economic impacts on small business or generally. These

facts and comments demonstrate and it is OSHA's conclusion, that the Standard needs to be retained substantially unchanged.

OSHA enforces the standard generally and through various special emphasis programs, issuing substantial numbers of citations. OSHA has provided training and outreach materials. (See for example the card in App. IV available in Spanish as well as English). Over the years OSHA has issued many interpretations and the standard has been interpreted by the Review Commission and Courts.

The public has suggested a number of changes which the commenters believe will improve the Standard. These are discussed below along with OSHA's responses.

However, such suggestions, which OSHA welcomes, need to be reviewed in the context of a successful standard. OSHA has limited regulatory resources. Significant modifications to a standard take substantial agency resources which may well be better spent in areas where standards have not been updated and other safety matters could be addressed. Also, as some commenters have pointed out, changes in settled and interpreted regulatory language invariably lead to a period of uncertainty, further interpretations and litigation, which reduces the value of the changes, at least in the near term. OSHA values suggestions to improve its outreach and training materials and efforts, and as resources become available will update and extend those materials and efforts.

Opinions were more varied, however, with respect to how compliance rates could be improved and whether the standard should be revised. As discussed in greater detail below, some commenters argued that OSHA should increase its efforts to enforce the standard (AFSCME, Burson, Mickle, Trench Shoring Services). Other commenters stated that outreach, education, and training would be effective tools for improving compliance (ABC, AFSCME, AGC, Burson, Dotson, Duininck, NIOSH, NUCA). Although a number of commenters stated that the standard can and should be improved (BCTD, Burson, CTT, NUCA), or suggested specific improvements, several commenters opposed revising the standard (AGC, Mickle, Trench Shoring Services). Two commenters argued that changes would only serve to confuse those who now understand and follow the standard (Mickle, Trench Shoring Services).

None of the commenters stated the Excavations Standard should be rescinded as a whole, although two argued that the standard should be rescinded or substantially modified for a particular industry (NAHB, PLCA). In addition, no evidence was presented of economic hardship resulting from implementation of the standard.

The following are public comments, received on specific issues relating to the Excavations Standard.

Updating the Standard (General Opinions)

A number of commenters stated that the standard can and should be improved (BCTD, Burson, CTT, NUCA). Several commenters suggested specific improvements, as discussed later in this Chapter.

Several commenters argued against changing the standard (AGC, Mickle, Trench Shoring Services). Two commenters argued that changes would only serve to confuse those who now understand and follow the standard (Mickle, Trench Shoring Services). One stated that it is effective, clear, and easy to understand (AGC). Another stated that technological updates are provided with the manufacturer tabulated data, which are periodically updated by the manufacturers (Mickle). Another stated that the standard should be left as is until a significant effort can be made to revise it. This comment also noted a forthcoming meeting of the ANSI A10.12 Committee to review ANSI's excavations standard (Mickle).

One commenter argued that even though the standard could be made less complex, it is beginning to work because of the stability of the rules and the gradual simplification of related training. If the standard is changed substantially, then confusions and lack of clarity will be renewed for another decade (Trench Shoring Services). A similar comment warned that changes would only serve to confuse and discourage those who have studied and attended classes and are currently following the standard (Mickle).

Relative Burden of the Standard on Small Entities and the Industry in General

Most of the comments that addressed the issue of regulatory burden on small entities or on industry as a whole indicated that the standard did not impose an unnecessary or disproportionate burden on small businesses or on industry in general (Burson, Mickle, Trench Shoring Services). One commenter stated that trench boxes are not expensive pieces of equipment even for small contractors (Mosser Group). Two stated that the standard resulted in a level playing field for large and small contractors (Mosser Group, AFSCME). Others suggested that by reducing accidents, the standard may improve productivity (AGC, Burson). Another argued that any burden could not be considered unnecessary until there are no more injuries, deaths, or exposure to the potential of injury (Trench Shoring Services).

One commenter agreed that the standard was not a burden on industry, but assumed that the standard resulted in cost pressures on smaller firms (ABC). Another stated that an unnecessary burden on small contractors results from two specific aspects of the standard (as discussed in more detail later in the chapter): OSHA enforcement efforts, and the rescue equipment required by Section 1926.651(g)(2) (NUCA).

Causes of Non-Compliance

Commenters cited three main reasons contractors do not always comply with the standard. The most commonly cited cause was inadequate supervision by contractors that know about the standard (Burson, Mickle, Trench Shoring Services, AFSCME). Similarly, an additional commenter stated that non-compliance is due to lack of self-enforcement by some companies (AGC). Another indicated that, while not pervasive, there is a problem when supervisors themselves are not following the standard (ABC).

The second reason cited for non-compliance was lack of information or adequate training (ABC, AFSCME, Kundel, Mickle). One commenter stated that most small firms and infrequent excavators know of OSHA, but not the specific requirements (Mickle). Another stated that non-compliance is an issue for small contractors and non-union workers, who may not realize that doing things the right way ultimately will save them time and money (Kundel).

The third reason cited as a cause of non-compliance was cost pressure (ABC, AFSCME, Mickle). One commenter stated that cost pressures are a significant factor for those who are not properly capitalized in the first place and that, for them, safety is the first thing to go. This commenter opined that it would be very difficult to modify the standard to reduce costs without reducing worker protection (Mickle). Another commenter suggested that firms that do not comply with the standard have a competitive advantage over those that comply (ABC).

Other commenters, however, suggested that compliance with the standard *reduces* costs. One commenter stated that the use of trench shields and shoring enables contractors to get more production because it establishes a rhythmic, assembly-line type pattern to the job (Kundel). Another suggested that proper training in the use of safety equipment increases productivity (Burson). Several commenters stated that compliance costs will vary based on specific job conditions, including the size of the excavation, soil type, structures and other improvements, environment, and crew qualifications (Burson, Mickle, Trench Shoring Services, AFSCME).

Finally, NIOSH reported that, based on analysis of FACE investigations, compliance barriers are related to factors associated with company policies rather than the actions of individuals, as evidenced by the lack of pre-job hazard analyses and the lack of installation of protective systems. NIOSH also stated that many firms do not have adequate safety programs and the incidence of this is correlated with firms with fewer than 11 employees.

OSHA's enforcement experience indicates that some employers may be aware that OSHA has a standard for trenching and excavation safety, but may lack familiarity with its specific requirements, thereby exposing their employees to various hazards. However, OSHA does have extensive outreach programs to bring excavation requirements to the attention of small businesses and construction employers.

Enforcement

Several commenters suggested that OSHA should increase enforcement efforts in order to achieve higher compliance levels (AFSCME, Burson, Mickle, Trench Shoring Services). One stated specifically that OSHA should increase the number of inspections (Burson). Two commenters suggested that criminal prosecution may be necessary (Burson, Mickle). Another commenter stated that 80 percent of the excavation sites visited use no protective systems at all, even though there is awareness that a standard exists. This commenter stated that there are no significant measures for additional protection that would make a difference in the current level of compliance other than enforcement (Trench Shoring Services).

Several commenters raised issues with enforcement practices. One stated that OSHA inspectors should not substitute their judgment for that of the project supervisor, presumably a competent person; that care is required before using lab tests to verify or contradict field tests or evaluations; and that fines for violations should be used only for egregious violations or as a last resort (Duininck Bros).

NUCA asserted that an unnecessary financial burden on small contractors results when OSHA compliance officers and area directors are overzealous or not thoroughly versed in the standard. For example, according to the commenter, some area offices still issue violations to contractors for not having protective systems designed by a registered professional engineer even though the tabulated data for the trench box or other protective system (which is approved by a registered professional engineer) clearly indicates that it is adequate. This results in unnecessary consultations with attorneys and engineers, and in inconsistencies in compliance, enforcement, and training efforts around the country. Also, a trench that measures 5 feet 3 inches in a few spots due to land contour, or an excavation with a slope just short of 1½:1 in Type "C" soil, should not warrant a written violation as it is a minor infraction that would not cause the trench or excavation to be less stable (NUCA).

OSHA does extensively enforce the Excavations Standard, as the data in Chapter 4 demonstrate. The Agency has had special emphasis programs in place since 1987, and OSHA also has in place a policy to inspect every regulated trench identified by Area Offices. OSHA inspects excavation contractors of all sizes. Congressional limitations on inspections of small employers just apply to general schedule inspections of employers with ten or fewer employees in industries with below average injury rates; injury rates are above average for excavation contractors. While OSHA imposes civil penalties for violation of the standard, OSHA can only recommend criminal prosecution; the Department of Justice makes the determination, and there are strict statutory requirements for criminal prosecutions.

OSHA does not agree that "(e)nforcement and penalties should be the last resort." We believe that a strong enforcement program is the underpinning for a successful outreach program and compliance. We strongly agree, however, that training and education programs and other outreach assistance significantly enhance worker safety and are to be encouraged; OSHA is willing to do whatever it can to develop, provide and support such outreach.

OSHA does have programs in place through training and manuals for uniform and reasonable citation policies by its compliance officers. OSHA is in the process of developing a new field audit program to help ensure enforcement consistency.

Education, Training, and Outreach

A number of commenters indicated that education, training, and outreach for contractors and for employees would be effective methods of improving compliance with the standard (ABC, AFSCME, AGC, Burson, Dotson, Duininck, NIOSH, NUCA). Several suggested it would be effective for smaller businesses (ABC, AGC, NIOSH), and one suggested it would be effective for minority contractors (AGC).

Several commenters suggested that OSHA use certain methods or distribution techniques:

- Produce materials in video or brochure format in both English and Spanish and make the materials available to firms that inquire about compliance with the standard (ABC).

- Establish a clearinghouse for excavation and trenching compliance materials (NIOSH).

- Focus efforts on smaller businesses, particularly those with fewer than 11 employees that are not subject to routine inspections (NIOSH).

- Continue to work with organizations such as construction trade associations, the National Federation of Independent Business and the United States Chamber of Commerce, along with their local affiliates, to deliver information to employers and employees through mail, e-mail lists, fax, newsletters and magazines, safety fairs and conferences, and national and local training programs (NIOSH). NIOSH also identified other potential partners or sources of information including insurance companies, the Department of Transportation, and the Office of Pipeline Safety.

- Mirror industry efforts in conducting outreach to small contractors (AGC).

- Provide grant funds to extend OSHA's ability to offer educational and outreach programs (AGC, AFSCME).

In terms of the content of the information, commenters suggested the following:

- Simplified versions of the standards (ABC).

- Compliance resources for both the public and private sectors, including toolbox talks, checklists, manuals, training videos, web training, classroom training, and other specific items (NIOSH).

- Information on the development, availability, and potential applications and limitations of trenchless technologies (NIOSH).

- Cost-saving options, including options for smaller firms (ABC, NIOSH). For example, instructing firms in soil testing allows them to choose the protective device appropriate for the specific requirements of the job rather than simply selecting a device large enough to protect against any soil type, a potentially more expensive choice (NIOSH).

The Agency has placed significant emphasis on promoting understanding of the excavations standard. An Industry task force was assembled to assist us in identifying effective outreach programs which the Agency might undertake. The Advisory Committee on Construction Safety and Health (ACCSH) established a workgroup for the same purpose. As a result OSHA developed and distributed over 100,000 trench safety cards. (See App. IV.) OSHA continues to distribute these cards and, in addition, has developed a worksite poster for distribution as well. OSHA and NIOSH, working together, reached out to over 420 construction stakeholders involved in excavation and trenching activities, calling their attention to the need to focus on eliminating trench-related hazards and asking their cooperation in reducing trench-related fatalities at their worksites. OSHA has received positive responses from many of the recipients of these letters. In light of those comments OSHA will continue to improve its outreach activities in conjunction with NIOSH, employers, and unions.

There were a number of specific suggestions on outreach. The AGC suggested that "OSHA should extend its outreach programs to assist contractors in identifying the safest most efficient method of compliance with the standard. Cost pressures…require more assistance from OSHA to provide educational and outreach programs to small and minority contractors." They went on to list several examples of safest/most-efficient compliance methods:

> "For example, using trench shields in a trenching situation might be less costly, because sloping of the trench creates an additional amount of excavated material that has to be removed and disposed, creating additional surface restoration.
>
> Also, utilizing adequately designed trench shields for a deep sewer project requires a larger excavator to pull and lift the trench shields in and out of excavations. The deeper the cut, the more the trench shield must weigh to support the load.
>
> The safety cost of the project generally increases with the following variables; pipe size, type of pipe, right-of-way easements and soil type.
>
> Marketing to media is another cost-effective way of educating the public on the hazards of excavation."

OSHA is happy to assist contractors and their trade associations in providing such training to identify the safest and most efficient method of compliance with the standards. OSHA has already taken steps to provide educational and outreach programs to small and minority contractors.

NIOSH provided a comprehensive response regarding increasing awareness of the standard, including a number of specific recommendations. They began by noting that of the 30 FACE investigations of trenching or excavation-related fatalities, the "[d]ata on employers' knowledge or awareness of complying with safety standards…[Showed that] [m]ore than half (17) of the employers had a written safety and health program…however, the FACE investigations do not provide enough detail to determine if these programs included information on trenching hazards or compliance with the excavations standard…" But NIOSH found that "[a]ll the employers with written safety and health programs had 11 or more employees". NIOSH then recommended "that OSHA promote employer awareness by increasing outreach, training, and education to smaller businesses …." As already pointed out OSHA agrees that increased outreach and training, particularly among small employers, are important elements in addressing the problem of trench-related fatalities. Indeed, in 2004, ACCSH established a workgroup to investigate feasible and effective measures to address the problem. The workgroup is charged with devising workable recommendations that might be provided to the Agency for consideration.

Bid Practices

Commenters noted that most bids do not require any specific safety measures, plans or compliance certifications (ABC, NUCA). One commenter agreed that there is no national consistency in the use of the standard as a component of bid documents in public or private projects, but the commenter stated that this would seem fairly easy to achieve in projects that are federally-funded (Trench Shoring Services). Another commenter stated that although several states have attempted to enact bills requiring this, it is not a particularly popular item for legislation (Mickle).

Other commenters described their perception of the effects of this lack of standardization. For example, one commenter suggested that it leads to a competitive advantage for firms that do not comply with the standard, and ultimately to a shrinking pool of safety-conscious companies bidding on municipal projects (ABC). Along similar lines, another commenter stated that when safety requirements are included in bid documents, this encourages compliance with the standard, and when bids do not explicitly address safety issues, there is a lower likelihood that the project owner will inspect for safety (Burson).

Commenters offered the following suggestions with respect to bid practices:

- Require project designers or owners to include requirements for protective systems and list them in the job specifications with all other bid items (NUCA).

- Require bidding entities to demonstrate their commitment and capacity to comply with all aspects of the standard (AFSCME).

It is unclear whether OSHA has authority to require specific requirements in the bidding process. OSHA is willing to take reasonable steps to encourage and educate contractors to place such requirements in their bidding documents.

Competent Person

Several commenters argued that the qualifications of a "competent person" should be made more explicit (AFSCME, BCTD, TCP).[33] One of these suggested that each competent person should be trained and have a card with the date issued, date of expiration, name, and photo. The card would be issued only after the person passed an excavation safety course with a score of 80 percent or better. It would expire in two years unless refresher training and re-testing occurs (TCP). Another commenter agreed that the standard should define what training is necessary to qualify someone as a competent person. This commenter, suggesting a relevance to excavations, cited a study of scaffold competent persons that found that (1) most scaffold competent persons had no scaffold safety training, and (2) the scaffolds overseen by those who had received scaffold safety training were safer than those overseen by untrained competent persons (BCTD).

Several commenters suggested expanding the role of the competent person. For example, two commenters pointed to requirements in the U.K. and recommended that competent persons should be required to document and submit reports of daily inspections and corrective actions taken. This record would be useful to identify trends and to assist in re-training (BCTD, NIOSH). NIOSH also stated that under the U.K. construction requirements, the competent person supervises the installation, alteration, or removal of excavation support. AFSCME stated that a competent person is not assigned to all excavation

[33] Section 1926.650(b) defines a competent person as one who "is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."

jobs, and that many employers are not aware that a competent person must inspect each site before work begins. Sometimes a senior person or equipment operator assumes the competent person role even if that person is not qualified (AFSCME). Two commenters noted the importance of the job of competent person in protecting workers (Mickle, NIOSH). NIOSH recommended enhanced training or accountability or expansion of the competent person's duties, given that injuries occur even when trenches have been inspected by competent persons.

OSHA has issued several interpretations in recent years that address the requisite knowledge for competent persons in the context of other standards and in general address the public suggestions. In an August 1, 2000, interpretation, OSHA explained that:

> "In the situation you have described, the competent person must be able to assess the load of employees, equipment and materials placed on the scaffold's foundation. While an engineering degree is not a prerequisite, that assessment normally requires some technical skills, and the competent person making that determination would have to have those skills."

In a July 16, 2003 Memorandum, the Agency again elaborated on the qualifications for a competent person under the scaffold standard:

> "The preamble to the Final Rule published in the Federal Register (61 FR [46059], August 30, 1996) [for) §1926.451(f)(3) states that "a 'competent person' for the purposes of this provision must have had specific training in and be knowledgeable about structural integrity of scaffolds and the degree of maintenance needed to maintain them.
>
> "In order for an employee to assess if a scaffold can withstand the additional, wind-imposed forces from being enclosed, the individual must be a competent person, which in this case means having specific training in and being knowledgeable about the structural integrity of a scaffold and how the loads imposed by a trap enclosure can affect that integrity."
>
> "Note that in Superior Masonry Builders, OSHRC Docket No. 96-1043 (July 3, 2003) the Occupational Safety and Health Review Commission ruled that an experienced lead laborer who lacked training on the use of wind enclosures was not a "competent person" for purposes of inspecting the scaffold for hazards it stated:
>
> 'Under Commission precedent a person is found to be competent when he [or she] makes an inspection in a competent manner and makes a reasonable determination that the condition is safe. Superior argues that the lead laborer designated as its competent person was an experienced skilled tradesman who exercised his judgment based on his training and experience. However, experience alone does not qualify the designated employee as a 'competent person.' We find that the lead laborer was not properly trained and therefore was not a competent person. The evidence shows that he was not instructed about the specific hazards presented by attaching enclosures to scaffolding and thus was not capable of identifying hazards… [Citations omitted.]

Though this guidance is informative to employers who perform work covered by the Excavations Standard, OSHA will consider issuing an interpretation or other guidance to provide further clarification on the term "competent person" in the context of subpart P.

It was suggested that OSHA could strengthen the standard by requiring that a competent person document the findings from the excavation inspection. This suggestion is based on the example of the United Kingdom, where inspections and corrective actions are required to be documented.

In general, the standard currently requires protective systems to be used in all excavations 5 feet or deeper. If a trench is less than 5 feet, a protective system is required except where a competent person finds that it is unnecessary. In the Agency's experience, most fatalities occur in excavations 5 feet or deeper in which no protective system is being used. In those cases a competent person determination was not needed to trigger the requirement for using a protective system. Therefore, with respect to reducing fatalities, it seems unlikely that the type of competent person documentation requirement suggested would reduce the number of these types of accidents. Also the Paperwork Reduction Act makes it difficult for OSHA to increase paperwork requirements in those circumstances (i.e., in situations where the information collected has an uncertain relationship to the prevention of workplace accidents.).

Excavation Equipment and Trucks

The Building and Construction Trades Department of the AFL-CIO (BCTD), in a comment also supported by the IBT, claimed that 10 percent of trenching deaths are related to excavation equipment or trucks and that additional protection is needed in this regard. One such measure could require the establishment of controlled access zones in the vicinity of excavation equipment working near or in trenches. Only essential workers would be allowed in the controlled access zones. In addition, spotters should be mandatory to alert the equipment operator and protect these workers. It also stated that the existing requirement that allows only employees "qualified by training or experience to operate excavation machinery and equipment" (29 CFR 1926.20(b)(4)) is too vague and does not require certification of training, such as is required for forklift operators in 29 CFR 1910.178(l). AFSCME also recommended enhancing protections related to work zone safety requirements where excavation work is conducted in traffic areas.

This comment raises the possibility that one of the hazards associated with excavation work, powered excavation equipment running forward and hitting workers or collapsing a trench, may not be adequately addressed by the existing standards. Subpart P does not address the hazards described. 29 CFR 1926.601(b)(4)(i) and 1926.602(a)(9)(ii) address the hazard of excavation equipment and trucks with a restricted rearward view striking workers. However, the scenarios described by BCTD include struck-by hazards where the equipment is not backing up. OSHA will consider a suitable way to respond to these hazards, as well as swing radius. It may be appropriate to propose an amendment in Standards Improvement Project III to address these issues.

Hazardous Atmospheres

Three commenters addressed the related issue of confined spaces, as discussed in this paragraph. One commenter stated that 1926.651(g)(1)(iii) requires taking action when an atmosphere containing flammable gas is 20 percent of the lower flammable limit of the gas, while the confined space standard requires taking action at 10 percent. The commenter urged OSHA to provide a clarification and change the requirements so they are similar (NUCA), claiming that OSHA stated, in a March 23, 1993 letter to NUCA, that "under normal circumstances, a trench would not be considered a confined space" because the Excavations Standard addresses the issue of hazardous atmospheres. NUCA stated that OSHA should clarify that the Excavations Standard did not intend for trenches to be considered confined spaces. An unnecessary financial burden falls on contractors when owners do not recognize the distinctions and require contractors to treat trenches like permit-required confined spaces, which is not practical or required (NUCA). A second commenter suggested that OSHA consider combining the excavation and confined spaces requirements in one standard for ease of use (ABC). Finally, a third commenter suggested that the provisions be reviewed to see if they are useful or burdensome (Duininck Bros).

OSHA is conducting rulemaking for a confined space standard for construction. One of the issues being addressed in that rulemaking is whether that new standard should apply to excavations. When the confined space proposed rule is published the public will have an opportunity to comment on this issue.

Emergency Rescue Equipment

NUCA suggested that 1926.651(g)(2)(i) could be removed without jeopardizing safety, because it creates an unnecessary financial burden and does not reduce excavation accidents. Workers, few of whom are trained to jump into a confined space in a rescue attempt, should not be encouraged to do so. Rescue operations in these types of situations are better left to experienced and trained rescuers and emergency response teams that are adequately equipped to handle these situations. NUCA also suggested that this requirement would be disproportionately burdensome on small contractors by expecting them to purchase rescue equipment that is not likely ever to be used and to provide rescue training to all workers (NUCA).

The preamble to the final rule (Oct. 31, 1989, 54 FR 45921-45922) points out that during the rulemaking for this subpart, OSHA received a great number of comments on this provision which the Agency weighed before adopting the provisions.

NUCA's comments are, in essence, that having such equipment on site does not add to safety because construction employees are normally not trained to do rescues, and that this work should be left to outside emergency responders. In a March 23, 1992 OSHA interpretation letter to Mr. Kennedy of NUCA, OSHA stated that reliance on a off-site rescue service to provide rescue if needed would not be considered a substitute for compliance with this provision.

Subsequently to the issuance of that letter, in 1994, OSHA enacted a confined space standard for general industry (which does not apply to construction). Under that standard, employers can choose to rely on an outside rescue service if certain conditions are met. OSHA will re-evaluate the 1992 letter to Mr. Kennedy in light of the policy embodied in the 1994 general industry confined space standard.

Timber Shoring

One commenter stated that Appendix C on timber shoring should be deleted from the rule, as no one uses timber shoring anymore; however, if it is retained, then the formula at the top of each table should be explained. This commenter noted that the numbers for lateral earth pressure in the tables are not mentioned anywhere else in the standard; in addition, the pressures of 25, 45, and 80 psf are arbitrary, and numbers of 20, 40, and 80 psf are more realistic (Burson).

Another commenter urged that the rule continue to address timber shoring (Trench Shoring Services). This commenter stated that timbers are still used, although the frequency has decreased over the last decade and will continue to decrease over the next decade. In contrast to manufactured systems for which "tabulated data" are available, timbers lack any similar resource apart from the Excavations Standard; consequently, it is important that the standard serve as a readily-available archive of tables and charts in case timbers are chosen. The standard charts for timbers should be clarified, however, by removing the relationship to A, B, and C soil and maintaining the relationship to the actual earth pressures the charts are based upon. The contractor can then select the applicable chart based upon actual earth pressure rather than textural classification. This requires no modification to the chart engineering because the earth pressure is already noted and qualified with each chart (Trench Shoring Services).

OSHA's information and experience is that timber shoring is still in use. With respect to the lateral earth pressures, the Agency will investigate the commenter's suggestions.

Soil Types

A commenter stated that Appendix A, Soil Classification, should be re-written so that it is simpler and less difficult for people in the field to understand and use. The TSSA Classification of C-60 should be added. Classification C-60 should be called something else (maybe B-, or BC), however, because the standard should not specify an earth pressure for each type of soil. The C-60 definition is simple and easy to understand, while the A, B, and C definitions are too complicated (Burson). A few other commenters made similar suggestions.

As discussed extensively in the preamble to the final rule (Oct. 31, 1989, 54 FR 4536-45942), the soil classification system in Appendix A was developed by the National Bureau of Standards (now the National Institute for Standards and Technology), and included several additional ASTM standards to supplement the classification system. The commenters have not provided sufficient new information to justify a reconsideration of the provision.

Applicability to Homebuilding

The National Association of Home Builders (NAHB) commented on the applicability of the standard to homebuilders. NAHB stated that once foundation walls are in place on a residential structure, the area between the wall and excavated soil is a trench and, under the terms of 1926.650(b), triggers the requirements of the Excavations Standard. In many instances, according to NAHB, it is not possible to use sloping or benching methods correctly due to adjacent property lines, structures, utilities, sidewalks, streets, curbs and gutters, protected environmental areas or other similar obstructions.

OSHA believes there is no need to change the standard. OSHA issued a memorandum of interpretation, dated June 30, 1995, clarifying those matters and resolving the issues raised by NAHB. See http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=21846

Applicability to Welded Steel Natural Gas and Liquids Cross-Country Pipelines

The Pipe Line Contractors Association (PLCA) requested that OSHA consider exempting welded steel natural gas and liquids cross-country pipelines from the Excavations Standard or, in the alternative, to promulgate different standards that are tailored to the "continuous excavations" common to the mainline pipeline industry. PLCA claims that there has not been a single construction worker employed by PLCA members killed in any excavation failure or cave-in incident in the last ten years. This lower risk is a consequence of the shallower and constant depth of the excavation, the relative experience of the skilled crews (e.g., welders) working in the trench, the fact that most labor is performed outside the trench, the higher chance of noticing changes in soil in a constant excavation, and the contractor's incentive to avoid re-excavation of the trench after a collapse.

OSHA will seek additional information on this issue as resources permit. It is a technical matter which requires consideration of many different issues and views.

New Technologies

One commenter stated that there have been incremental improvements and cost reductions in the manufactured protective systems for open excavations (e.g., lighter weight, more maneuverable, able to cross utilities), but no new concepts or technology since the current standard was enacted. The biggest change is the acceptance of manufactured systems as alternatives to site-built systems such as timbers. Developments in trenchless technologies have occurred but do not impact the current standard (Trench Shoring Services). Other commenters noted that directional boring machines, tunneling systems, and

other trenchless technologies have their own set of hazards (BCTD, Kundel, Mickle). During construction, an operator does not always see what lies in the way (e.g., a gas or water line can be ruptured). Further, the work is slow and not always accurate. After construction, there could be unseen voids left behind, which could lead to collapse (Kundel). One commenter suggested that OSHA revise the standard to address directional boring machines, tunneling systems, and other trenchless technologies (BCTD).

NIOSH raised the issue of remotely operated electronic video-monitoring equipment (e.g., sewer cameras), which may reduce the amount of time spent in trenches and underground work areas but also may have inherent hazards in flammable or explosive atmospheres, as addressed in a recent OSHA memorandum (NIOSH).

Many of the above recommendations and new technologies can be accommodated in the current Standard because of its flexibility. The Standard is performance-based (though it does provide specific requirements that an employer may follow and be in compliance). This means the Standard is adaptable to changes in technology.

Notification of Gas Line Ruptures

After excavators struck and ruptured an underground natural gas pipeline, and a fatal explosion resulted, the National Transportation Safety Board (NTSB) recommended to OSHA that OSHA "require excavators to notify the pipeline operator immediately if their work damages a pipeline and to call 911 or other local emergency response number immediately if the damages results in a release of natural gas or other hazardous substance or potentially endangers life, health, or property." OSHA issued a Safety and Health Information Bulletin (SHIB) 03-05-21, "Hazards Associated with Striking Underground Gas Lines," in response to this NTSB recommendation. In that SHIB, OSHA recommended "notifying the pipeline operator immediately if the excavator causes damage to a pipeline and to call 911 or other emergency response numbers if the damage results in release of natural gas or other hazardous substance." However, NTSB responded to OSHA's SHIB recommendation, stating that OSHA's SHIB recommendation can serve as a helpful reminder to contractors, but that OSHA requirements are more likely to be followed. OSHA then informed NTSB that its recommendation to require excavators to take immediate actions would be considered during OSHA's Section 610 review of the Excavations Standard.

Since then, the "Pipeline Inspection, Protection, Enforcement, and Safety Act (PIPES) of 2006" has been enacted. Section 2 of PIPES requires all persons (including employers) engaged in demolition, excavation, tunneling, or construction to immediately call 911 if: (1) they damage a pipeline that may endanger life or cause serious bodily harm or damage to property; and (2) such damage results in the escape of flammable, toxic, or corrosive gas or liquid. The enactment of PIPES may obviate the need for OSHA to promulgate a standard implementing the NTSB's recommendation. It also may affect OSHA's authority to issue such a standard. OSHA will monitor the implementation of the statute and consider whether amending the excavations standard as suggested by NTSB is necessary and appropriate.

7. The Excavations Standard and Small Businesses

This chapter of the review focuses on small businesses affected by the Excavations Standard. Section 7.1 begins by characterizing the number of small businesses affected by the standard. Next, Section 7.2 provides a further breakdown of affected firms by considering various ranges in the number of employees. Section 7.3 relates fatalities to firm size by, first, estimating the distribution of fatalities and the fatality rates for firms in different employment ranges and, second, by estimating the distribution of fatalities by the number of employees at the site. Section 7.4 describes the economic impacts of the standard on small businesses.

7.1 Estimation of the Number of Small Businesses

This study estimates the number and proportion of small businesses based on size standards established by the Small Business Administration (SBA). The SBA size thresholds for the 12 sectors of interest are stated in terms of annual revenue and are presented in Exhibit 7.1. However, because firm revenue data are not available, this study uses an alternate definition of small firms, based on employment. Specifically, firms are considered small if they have fewer than 500 employees. The SBA's Office of Advocacy often classifies firms with fewer than 500 employees as small.[34] Therefore, to estimate the impact of this rule on small businesses, this section analyzes the growth in the number of firms with fewer than 500 employees between 1989 and 1998. (Information on the construction industry is available only through 1998 using the SIC system, as discussed in Chapter 2.)

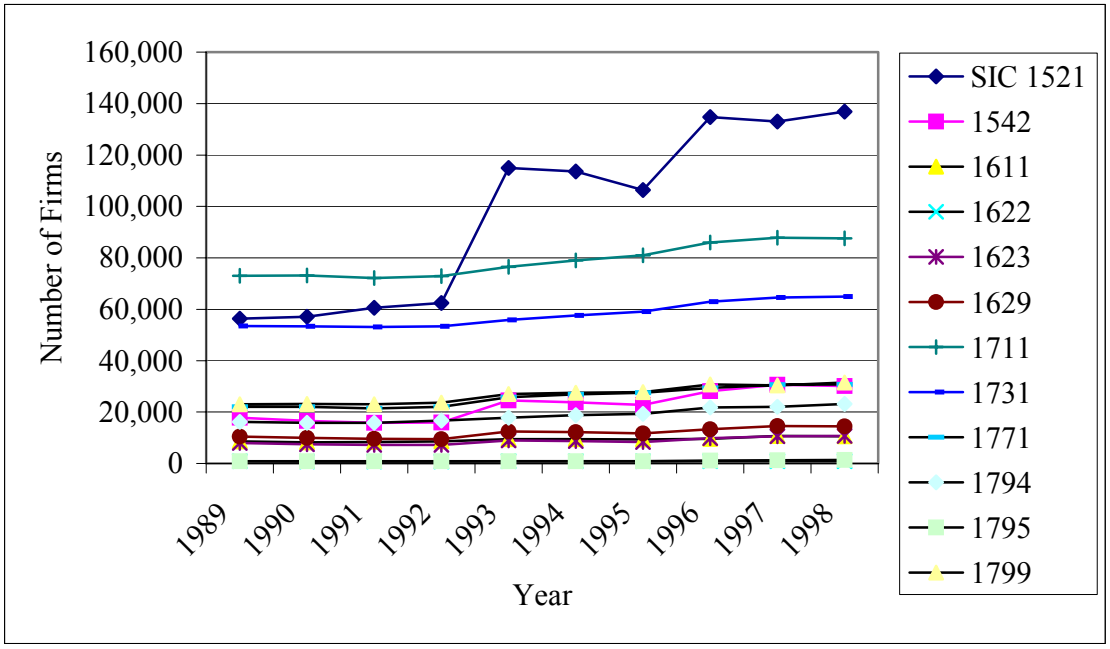
Exhibit 7-1
2000 SBA Size Standards for Relevant Construction Industry SIC Codes

SIC Code	Description	Size Standard (in millions)
1521	General Contractors-Single-Family Houses	$27.5
1542	General Contractors-Nonresidential Buildings, Other than Industrial Buildings and Warehouses	$27.5
1611	Highway and Street Construction, Except Elevated Highways	$27.5
1622	Bridge, Tunnel, and Elevated Highway Construction	$27.5
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction	$27.5
1629	Heavy Construction, NEC	$27.5
1711	Plumbing, Heating, and Air-Conditioning	$11.5
1731	Electrical Work	$11.5
1771	Concrete Work	$11.5
1794	Excavation Work	$11.5
1795	Wrecking and demolition work	$11.5
1799	Special Trade Contractors, NEC	$11.5

Source: "Small Business Size Standards Matched to SIC Codes, Effective through September 30, 2000," Small Business Administration. http://www.sba.gov/size/hist/siccodes-stds.html.

[34] For example, in a 1998 report titled, *Small Business Growth by Major Industry, 1988-1995*, SBA says, "When evaluating all industries, the Office of Advocacy often defines a firm with fewer than 500 employees as small."

Exhibit 7-2
Number of Firms with Fewer than 500 Employees (1989-1998)

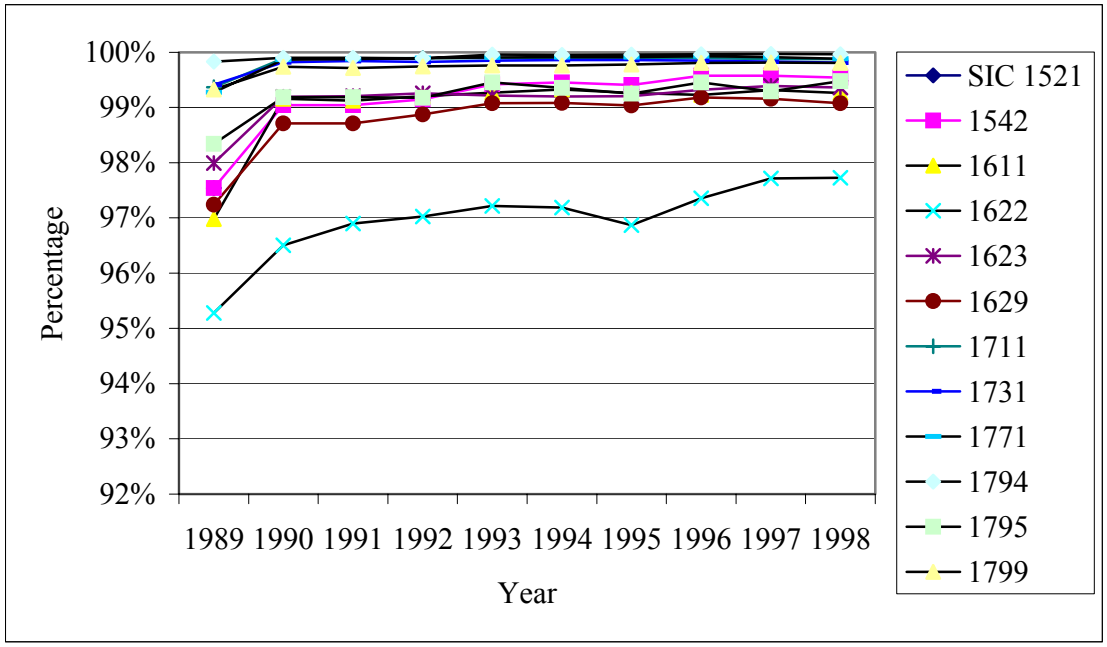


Source: ICF analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

Analysis of data for each of the 12 relevant SIC codes shows that the Excavations Standard has not adversely impacted small businesses. Not only has the number of small firms increased in each of the SICs between 1989 and 1998, as shown in Exhibit 7-2, but the proportion of all businesses that qualify as small also has increased in each SIC except one, as shown in Exhibit 7-3. These trends are particularly evident in those SIC codes most involved with excavation and trenching activities: 1623 (Water, Sewer, Pipeline, and Communications and Power Line Construction); 1711 (Plumbing, Heating, and Air-Conditioning); and 1794 (Excavation Work).

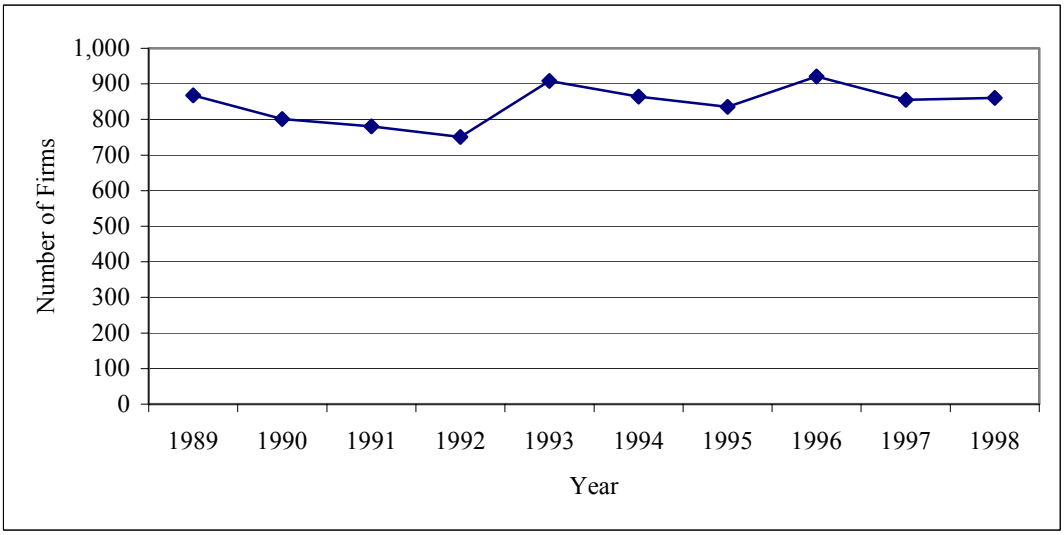
Only one of the 12 SIC codes, SIC 1622 (Bridge, Tunnel, and Elevated Highway Construction), experienced even a slight decline in the number of firms employing fewer than 500 employees between 1989 and 1998, as shown in Exhibit 7-4. In this sector, the number of firms with fewer than 500 employees declined very slightly between 1989 and 1998. However, the percentage of firms with fewer than 500 employees in the SIC code actually increased rather substantially during the same period, as shown in Exhibit 7-5. Therefore, even in SIC 1622, the Excavations Standard did not have a disproportionately negative impact on small businesses.

Exhibit 7-3
Percentage of Firms with Fewer than 500 Employees (1989-1998)



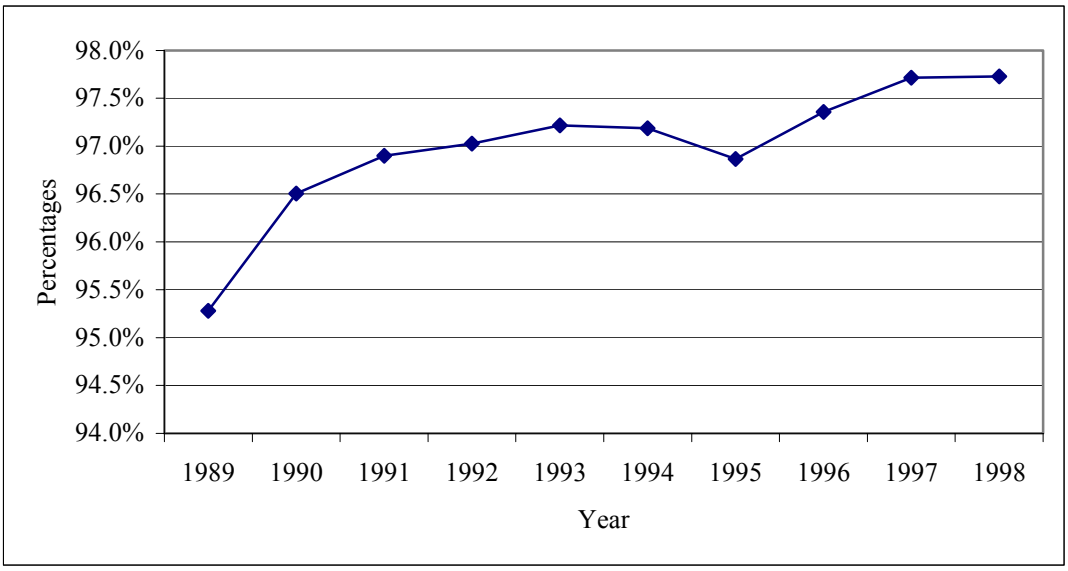
Source: ICF analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

Exhibit 7-4
Number of Firms with Fewer than 500 Employees in SIC 1622 (1989-1998)



Source: ICF Analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

Exhibit 7-5
Percentage of Firms with Fewer than 500 Employees in SIC 1622 (1989-1998)

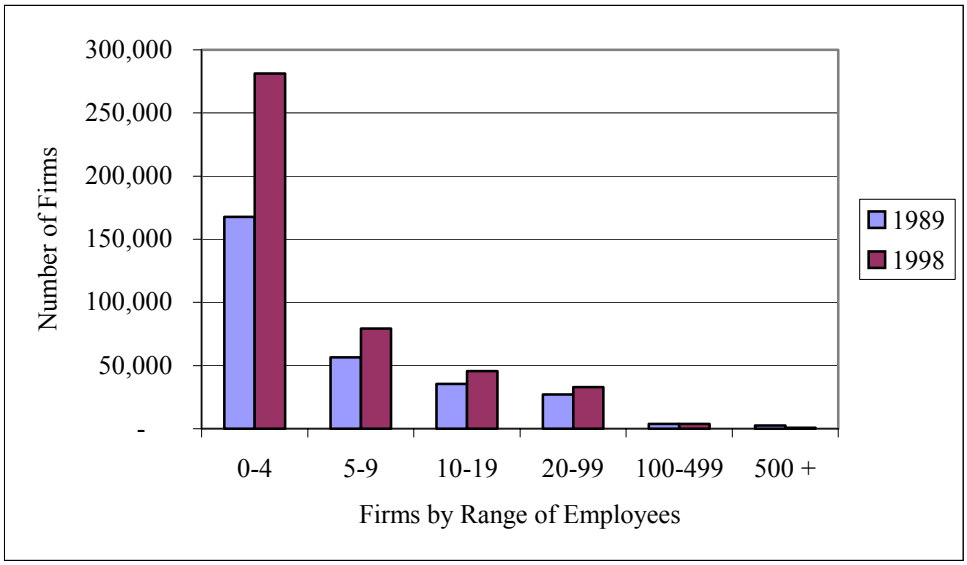


Source: ICF Analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

7.2 Distribution of Firms by Number of Employees

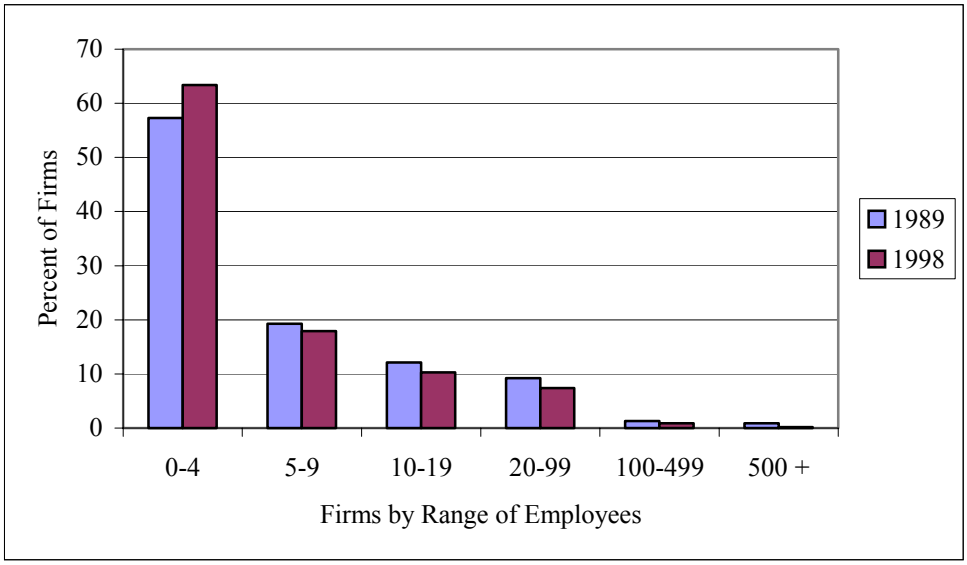
Analysis of the distribution of firms by number of employees shows that there has been the most growth in the number of firms in the smallest size categories, with successively lower growth in each higher size category (see Exhibit 7-6) and percent (see Exhibit 7-7). For example, there has been more growth in the number of firms employing between one and four employees than there has in any other size category. There was a slight decline in the number and percent of firms employing over 500 employees between 1989 and 1998. Exhibit 7-8 shows the percentage change in the number of firms in each employee size category for each of the 12 individual SIC codes. These results suggest that small firms were the fastest growing segment of the construction industry.

Exhibit 7-6
Number of Firms by Employee Size Categories for Selected Construction Industry SICs (1521, 1542, 1611, 1622, 1623, 1629, 1711, 1731, 1771, 1794, 1795, 1799) for 1989 and 1998



Source: ICF Analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

Exhibit 7-7
Percent of Firms by Employee Size Categories for Selected Construction Industry SICs (1521, 1542, 1611, 1622, 1623, 1629, 1711, 1731, 1771, 1794, 1795, 1799) for 1989 and 1998



Source: ICF Analysis of employee data obtained from U.S. Small Business Administration Office of Advocacy, Statistics of U.S. Businesses, 1990-1998, http://www.sba.gov/advo/stats/data.html#us, obtained December 4, 2003, and 1989 data obtained directly from United States Bureau of the Census.

Exhibit 7-8
Percent Change in The Number of Firms Across Employee Size Categories in Selected Construction SIC Codes Between 1989 and 1998

SIC	Percent Change in the Number of Firms					
	0 - 4	5 – 9	10 – 19	20 - 99	100 - 499	500 +
1521	169%	106%	58%	23%	-25%	-66%
1542	132%	64%	43%	13%	-15%	-69%
1611	37%	27%	22%	12%	-20%	-70%
1622	31%	11%	-4%	-17%	-18%	-53%
1623	57%	35%	18%	24%	9%	-57%
1629	36%	52%	42%	34%	-11%	-55%
1711	22%	16%	17%	22%	11%	-77%
1731	21%	18%	23%	29%	29%	-62%
1771	42%	38%	38%	27%	7%	-78%
1794	53%	32%	24%	9%	-26%	-70%
1795	84%	31%	33%	65%	45%	-50%
1799	50%	22%	16%	23%	-8%	-61%
Total	*68%*	*41%*	*29%*	*22%*	*-1%*	*-67%*

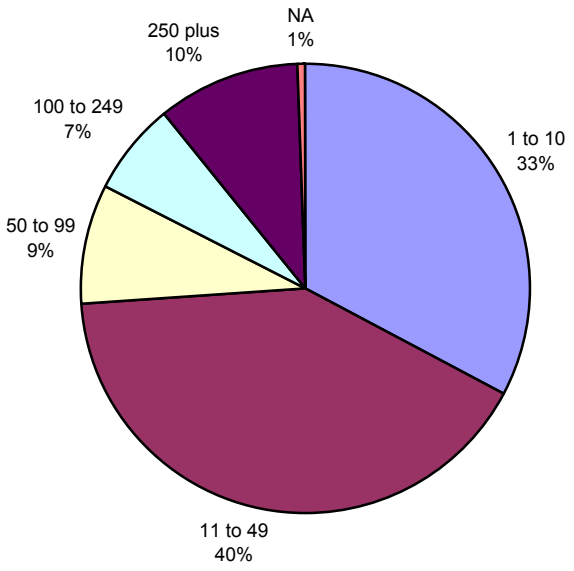
7.3 Fatalities by Firm Size and Number of Workers on Site

Exhibit 7-9 shows the distribution of excavation-related fatalities by the size of the firm experiencing the fatality. Approximately 73 percent of fatalities occur in firms with fewer than 50 employees. Of these:

- Approximately 33 percent of fatalities occur in the smallest firms, that is, firms with 10 or fewer employees.

- Approximately 40 percent of fatalities occur in firms with between 11 and 49 employees.

Exhibit 7-9
Distribution of Fatalities by Size of Firm

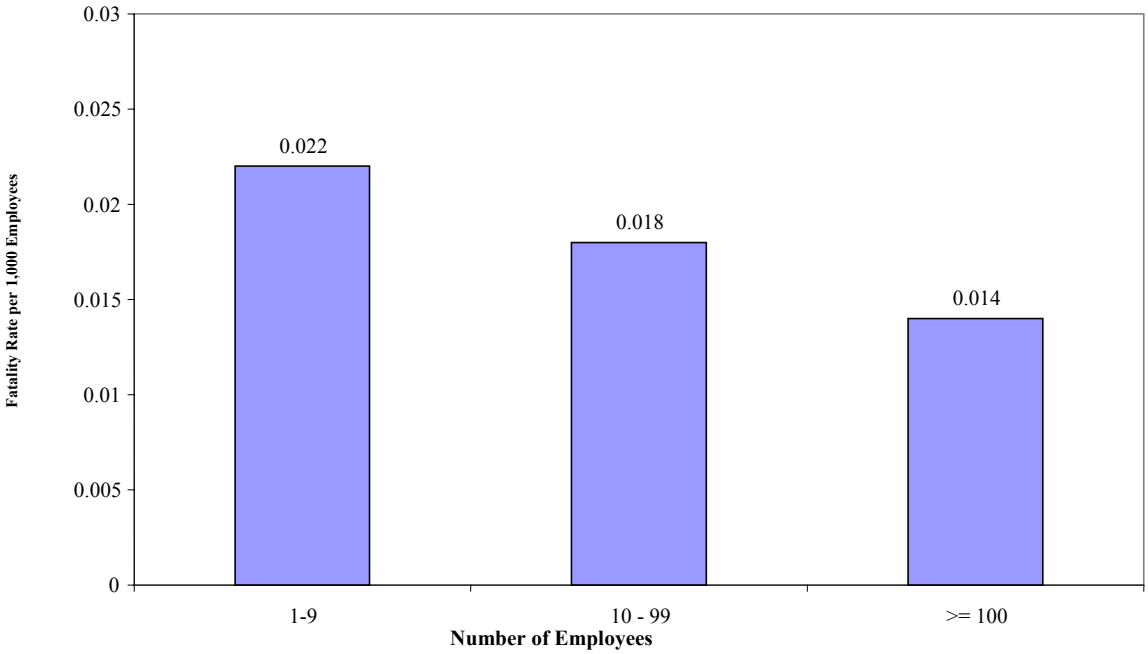


Source: ICF analysis of IMIS database.

This finding raises the question of whether smaller firms incur more fatalities than larger firms because smaller firms (in aggregate) undertake most of the excavations, or because they have less effective safety procedures. To address this question, this study estimated fatality rates (per 1,000 employees) for each firm size category. These rates were calculated by dividing the average number of fatalities in each size category for 1989-2000 by the number of employees (estimated) in the category in 2000. The results, presented in Exhibit 7-10, indicate that the smaller firms, in fact, have higher fatality rates than larger firms.[35]

[35] The firm size categories supported by the fatality data differ from those supported by US Census firm data. Consequently, the combined data set supports only the three size categories shown in the exhibit. The average number of employees in a given size category was calculated by taking the number of firms in the category (calculated as the number of firms in 2000) and multiplying it by the average number of employees in the category size range (e.g., 3 employees in the 1-9 category; 24 employees in the 10-99 category; 211 employees in the over 99 category). Because fatality data could be analyzed for firms with 1-10 employees but firm data were available only for the range of 0-9 employees, the resulting fatality rate for firms with 0-9 employees may be slightly overstated, while the rate for firms with 10-99 employees may be slightly understated. The magnitude of the bias is believed to be small, however.

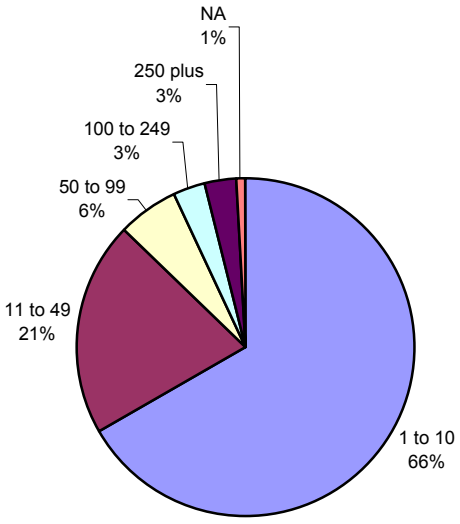
Exhibit 7-10: Estimated Fatality Rate by Size of Establishment Average 1990-1997



Source: ICF and OSHA Analysis of IMS Database and US Census and SBA Statistics

Exhibit 7-11 shows the distribution of excavation-related fatalities by the number of workers on site at the time of the fatality. While it is clear that more fatalities occur on smaller jobs (approximately 66 percent of fatalities occur at work sites with 10 or fewer employees), this could be a result of smaller jobs accounting for a majority of excavation and trenching activity. It is also possible, however, that oversight and compliance become less as firm size declines.

Exhibit 7-11
Distribution of Fatalities by the Number of Employees at the Site



Source: ICF analysis of IMIS database

7.4 Impacts on Small Businesses

This study examined economic impacts on small businesses in several ways.

- First, it considered the relative growth in the number of small businesses between 1989 and 1998, as well as the change in the percentage of small firms relative to large firms in individual industry sectors. This analysis, which is discussed in Section 7.1, finds that the number of small businesses and the percentage of businesses that are small has increased since the standard was issued.

- The second approach, discussed in Section 7.2, considered different subsets of small businesses (i.e., across several ranges of number of employees) and found that the smallest small businesses (those with 0-4 employees) were the fastest growing segment of the affected industry.

- Third, the study evaluated changes in the costs of protective systems from 1990-2001. As discussed in Chapter 5, the costs of protective systems such as trench boxes, aluminum shoring, and the use of sloping *decreased* by about 10 percent in real dollars between 1990 and 2001.

- Finally, the study considered the public comments submitted to OSHA for purposes of this review. Most of the comments that addressed the issue of regulatory burden on small entities or on industry as a whole indicated that the standard did not impose an unnecessary or disproportionate burden on small businesses or on industry in general. One commenter stated that trench boxes are not expensive pieces of equipment even for small contractors. Two stated that the standard resulted in a level playing field for large and small contractors. Others suggested that by reducing accidents, the standard may improve productivity. Another argued that any burden could not be considered unnecessary until there are no more injuries, deaths, or exposure to the potential of injury. One commenter agreed that the standard was not a burden on industry, but assumed that the standard resulted in cost pressures on smaller firms. Another stated that an unnecessary burden on small contractors results from two specific aspects of the standard (as discussed in more detail in Chapter 6 of this document): OSHA enforcement efforts, and the rescue equipment required by Section 1926.651(g)(2).

Based on all of these findings, OSHA concludes that the Excavations Standard does not impose an unnecessary or disproportionate burden on small businesses or on industry in general. Although the standard does impose costs, these costs are essential to protecting worker safety and by preventing cave-ins also have financial benefits for employers.

8. Section 610 Review

Section 610 of the Regulatory Flexibility Act directs agencies to review impacts of regulations on small businesses. The Section 610 review of the general impacts on small business are discussed in Ch. 7. Section 610 also provides that agencies should specifically consider five areas in reviewing the impact of a regulation on small businesses. This section discusses the impact of the Excavations Standard in these five areas, which are as follows:[36]

1. The continued need for the Standard.
2. The concerns about the complexity of the rule.
3. The extent to which the rule overlaps, duplicates, or conflicts with other Federal rules, and with State and local governmental rules.
4. The degree to which technology, economic conditions, and other factors have changed to affect the Standard.
5. The nature of comments received by OSHA about the Standard.

Continued Need for the Rule

There is a continued need for the standard. The annual number of trenching and excavation fatalities has declined from an estimated 90 fatalities per year prior to the enactment of the 1989 standard, to approximately 70 per year since 1990. This 22% reduction is even more impressive given the 20% real increase in construction activity over this period. In relation to increased construction activity, fatalities have been reduced by more than 40%, demonstrating that the standard has been effective.

Public commenters agreed that the standard, when complied with, helps prevent excavation and trenching accidents and helps protect worker safety. None of the commenters stated that the standard was not needed or should be rescinded as a whole. According to OSHA's inspection data, violations of the standard are a contributing factor in most excavation fatalities. OSHA concludes that the standard has improved safety, and the standard and its enforcement remain needed in light of the ongoing occurrence of fatalities related to its violation. As discussed in Ch. 7, the standard has not had any negative impacts on smaller businesses nor construction, generally.

Complexity of the Rule

OSHA received a substantial number of public comments related to the issue of the rule's complexity. Although the comments provided no indication that employers are unable to comply due to the complexity of the standard, the comments did suggest several ways in which the standard might be simplified or clarified. For example, commenters identified the following areas as possible ways to simplify the standard or remove complexity:[37]

- The qualifications and duties of a "competent person" could be made more explicit.
- The requirement that allows only employees "qualified by training or experience to operate excavation machinery and equipment" (29 CFR 1926.20(b)(4)) could be clarified.
- The sloping requirements could be simplified by making them the same for everything but rock.

[36] Regulatory Flexibility Act §610(b)(1).
[37] Refer to Section 6 for additional details regarding the public comments addressed in this section.

- The design of sloping and benching systems and design of support systems, shield systems and other protective systems could be simplified.

- The standard charts for timbers could be clarified by removing the relationship to A, B, and C soil and maintaining the relationship to the actual earth pressures the charts are based on.

- The standard's applicability to homebuilders could be clarified.

- The standard's applicability to welded steel natural gas and liquids cross-country pipelines could be reconsidered and clarified.

- Appendix A, Soil Classification, could be simplified so that it is easier for people in the field to use and understand.

Other commenters, however, argued that changes would only serve to confuse and discourage those who now understand and follow the standard. One stated that even though the standard could be made less complex, it is beginning to work because of the stability of the rules and the gradual simplification of related training; if the standard is substantially revised, then confusions and lack of clarity will be renewed for another decade.

OSHA has reviewed those comments on complexity in Ch. 6 and discusses its conclusions there. In a few cases modifications to the standard may be appropriate as regulatory resources become available. In other situations additional outreach materials will be the best response and in others OSHA has already issued interpretive materials which clarify the issues. In many cases OSHA concludes the current language is the best for clarity and worker protection.

Extent to which the Rule Overlaps, Duplicates, or Conflicts with other Rules

OSHA concludes that in general, the standard does not overlap, duplicate, or conflict with other state or federal rules. Several commenters, however, addressed a possible conflict between the Excavations Standard and OSHA's standard for confined spaces.

OSHA is working on a confined spaces for construction standard. The Agency will address this issue in that rulemaking, and there will be an opportunity for public comment and hearings.

Changes in Technology, Economic Conditions, and Other Factors

The primary economic and technological trend related to the Excavations Standard has been one of incremental refinement in manufactured systems and their increased affordability. As a result, the use of manufactured systems has increased while the use of site-built systems, such as timbers, has declined. However, public comment indicates that timber shoring is still used, albeit with decreasing frequency, and that it therefore is important for the standard to continue to address timber shoring.

A second trend of note involves the rise of so-called "trenchless" technologies (e.g., directional boring machines), which has added a new dimension to excavation work since the enactment of the Excavations Standard. While these technologies do not diminish the relevance of the existing standard, and they do reduce traditional hazards, they may be associated with their own set of hazards (e.g., leaving behind unseen voids). OSHA intends to monitor accidents involving trenchless technologies to determine whether an expansion of the existing standard may be warranted.

Except with respect to the decline in price of manufactured systems, as noted above, economic conditions have not changed in ways that would impact the standard. Public commenters did not present any evidence of economic hardship resulting from implementation of the standard. OSHA therefore, concludes that changes in technology and economic conditions do not warrant major changes in the Standard.

Nature of Comments Received

Section 6 of this report details the nature of the public comments that OSHA received during the course of this review. In general, comments were supportive of the standard and indicated that the standard does not impose an unnecessary or disproportionate burden on small businesses or on industry in general. A few comments indicated that general cost pressures are one cause of non-compliance. Several other commenters, however, cited reasons why the standard actually reduces costs.

Some of the comments argued that OSHA should modify or increase its enforcement and outreach efforts and that doing so would improve compliance rates and reduce fatalities. A number of these comments stated explicitly that these efforts – and not further rulemaking – would be the most effective way to improve safety during excavation and trenching. These comments included suggestions, as discussed in Section 6.

With respect to whether the standard should be revised, a few commenters argued that revisions would be counterproductive. However, another group of commenters favored revision and suggested specific ways that the standard might be improved. In addition to suggestions for reducing the standard's complexity or clarifying the standard, which are noted above, other suggested improvements include the following:

- Increase protections related to the use of excavation equipment and trucks (e.g., use spotters, controlled access zones, and better-qualified operators).
- Remove Section 1926.651(g)(2)(i) on emergency rescue.
- Require increased documentation.
- Add explanations of recent improvements in protective systems that are now available to the construction industry, including illustrations and charts explaining when these systems are appropriate.

OSHA's response to these and other issues are discussed in Ch. 6**.**

Determination of Whether the Rule Should be Continued, Amended, or Rescinded to Minimize Significant Economic Impacts on a Substantial Number of Small Entities

Based on the preceding analysis, OSHA finds that the Excavations Standard should be continued. It has reduced fatalities in excavation work. The standard does not impose significant or disproportionate economic impacts on small entities. Public commenters support retaining the Standard. OSHA will attempt to increase levels of compliance by expanding outreach and training materials and maintaining enforcement.

There were several suggestions to amend various provisions of the standard and other comments opposing any changes. OSHA is considering the NTSB recommendation on gas line leaks in light of the recently

enacted "Pipeline Inspection, Protection, Enforcement, and Safety Act (PIPES) of 2006". OSHA will address the possible conflict with the Confined Spaces Standard in the rulemaking on a new Confined Spaces Standard for construction.

Some members of the public have suggested a few other amendments to the standard. However, such suggestions, which OSHA welcomes, need to be reviewed in the context of a successful Standard. OSHA has limited regulatory resources. Significant modifications to a standard take substantial agency resources which may well be better spent in areas where standards have not been updated and other safety matters could be addressed. Also, as some commenters have pointed out, changes in settled and interpreted regulatory language invariably leading to a period of uncertainty, further interpretations and litigation, which reduces the value of the changes, at least in the near term. OSHA values suggestions to improve its outreach and training materials and efforts, and as resources become available will update and extend those materials and efforts.

9. Executive Order 12866 Review of the Standard

Executive Order 12866 on Regulatory Planning and Review states that agencies of the Federal government must review their existing significant rules "to determine whether any such regulations should be modified or eliminated so as to make the Agency's regulatory program more effective in achieving the regulatory objectives, less burdensome, or in greater alignment with the President's priorities and principles set forth in this Executive Order." This review focuses on four major points:

1. Whether the standard has become unjustified or unnecessary as a result of changed circumstances;
2. Whether standards are compatible with each other and not duplicative or inappropriately burdensome in the aggregate;
3. Whether the standard is consistent with the President's priorities;
4. Whether the effectiveness of the standard can be improved.

This review of the Excavations Standard, consistent with Executive Order 12866, finds that the standard has worked to a substantial degree, but there may need to be increased outreach to achieve further safety benefits for trenching and excavation workers.

Whether the Excavations Standard Has Become Unjustified or Unnecessary as a Result of Changed Circumstances

OSHA finds that the standard has significantly reduced the annual number of fatalities resulting from accidents involving excavations and trenching, despite growth in the relevant industry sectors. Nevertheless, approximately 70 fatalities per year still occur mostly from violations of the Standard. Therefore, the standard remains justified and necessary.

Whether the Standard is Compatible with Other Regulations and Not Duplicative or Inappropriately Burdensome in the Aggregate

In general, the standard is compatible and not duplicative with other state or federal rules. Several commenters, however, addressed a possible conflict between the Excavations Standard and OSHA's standard for confined spaces. As is discussed in Ch. 6, OSHA will be conducting a rulemaking on a confined space standard for construction. OSHA will address the issue in that rulemaking and the public will have the opportunity to comment on the issue.

Whether the Standard is Consistent With the President's Priorities

The standard remains consistent with the President's priorities. In 1970, concerned about the high rates of deaths, injuries, disabilities, and diseases associated with the workplace, Congress passed the Occupational Safety and Health Act (OSH Act). The OSH Act was passed by a bipartisan Congress "to assure so far as possible every working man and woman safe and healthful working conditions and to preserve our natural resources." OSHA was created to develop mandatory job safety and health standards and enforce them effectively.

The objective of Executive Order 12866 is to reform and make more efficient the regulatory process. The regulatory process must be consistent with the President's priorities to enhance planning and coordination with respect to both new and existing regulations; to restore the integrity and legitimacy of regulatory review and oversight; and to make the process more accessible and open to the public.

The Excavations Standard is consistent with these priorities because it has produced the intended benefits, a reduction in trenching and excavation fatalities, without excess costs or conflict with other regulations and with public input and support.

Whether the Effectiveness of the Standard Can Be Improved

OSHA believes that the Excavations Standard is the key factor in reducing the annual number of excavation and trenching fatalities from approximately 90 to approximately 70. However, the occurrence of accidents, injuries, and fatalities remains, mostly because of violations of the standard. Consequently, OSHA intends to improve compliance through improved outreach and training and maintaining enforcement.

10. Summary and Conclusions

OSHA finds that the Excavations Standard has been successful in helping to reduce excavation fatalities. The annual number of trenching and excavation fatalities has declined from an estimated 90 fatalities per year prior to the enactment of the 1989 standard, to approximately 70 per year since 1990. This 22% reduction is even more impressive given the 20% real increase in construction activity over this period. In relation to increased construction activity, fatalities have been reduced by more than 40%.

The standard has not had negative impacts on small businesses or construction activity, generally. The number of small businesses engaged in excavation work has increased in numbers and as a percentage of businesses. Excavation activity has increased, and the cost of various types of safety equipment has declined in real terms. New, safer technology has been developed.

Most remaining fatalities result from violations of the standard. Small firms have higher violation and fatality rates. To reduce fatalities further, OSHA will expand its training and outreach, as resources become available, and maintain enforcement.

APPENDIX I: REGULATORY FLEXIBILITY ACT, SECTION 610

§ 610. Periodic review of rules

(a) Within one hundred and eighty days after the effective date of this chapter, each agency shall publish in the Federal Register a plan for the periodic review of the rules issued by the agency which have or will have a significant economic impact upon a substantial number of small entities. Such plan may be amended by the agency at any time by publishing the revision in the Federal Register. The purpose of the review shall be to determine whether such rules should be continued without change, or should be amended or rescinded, consistent with the stated objectives of applicable statutes, to minimize any significant economic impact of the rules upon a substantial number of such small entities. The plan shall provide for the review of all such agency rules existing on the effective date of this chapter within ten years of that date and for the review of such rules adopted after the effective date of this chapter within ten years of the publication of such rules as the final rule. If the head of the agency determines that completion of the review of existing rules is not feasible by the established date, he shall so certify in a statement published in the Federal Register and may extend the completion date by one year at a time for a total of not more than five years.

(b) In reviewing rules to minimize any significant economic impact of the rule on a substantial number of small entities in a manner consistent with the stated objectives of applicable statutes, the agency shall consider the following factors--

(1) the continued need for the rule;

(2) the nature of complaints or comments received concerning the rule from the public;

(3) the complexity of the rule;

(4) the extent to which the rule overlaps, duplicates or conflicts with other Federal rules, and, to the extent feasible, with State and local governmental rules; and

(5) the length of time since the rule has been evaluated or the degree to which technology, economic conditions, or other factors have changed in the area affected by the rule.

(c) Each year, each agency shall publish in the Federal Register a list of the rules which have a significant economic impact on a substantial number of small entities, which are to be reviewed pursuant to this section during the succeeding twelve months. The list shall include a brief description of each rule and the need for and legal basis of such rule and shall invite public comment upon the rule.

APPENDIX II: INTRODUCTION AND SECTION 5 OF EXECUTIVE ORDER 12866

REGULATORY PLANNING AND REVIEW

The American people deserve a regulatory system that works for them, not against them: a regulatory system that protects and improves their health, safety, environment, and well-being and improves the performance of the economy without imposing unacceptable or unreasonable costs on society; regulatory policies that recognize that the private sector and private markets are the best engine for economic growth; regulatory approaches that respect the role of State, local, and tribal governments; and regulations that are effective, consistent, sensible, and understandable. We do not have such a regulatory system today.

With this Executive order, the Federal Government begins a program to reform and make more efficient the regulatory process. The objectives of this Executive order are to enhance planning and coordination with respect to both new and existing regulations; to reaffirm the primacy of Federal agencies in the regulatory decision-making process; to restore the integrity and legitimacy of regulatory review and oversight; and to make the process more accessible and open to the public. In pursuing these objectives, the regulatory process shall be conducted so as to meet applicable statutory requirements and with due regard to the discretion that has been entrusted to the Federal agencies.

Accordingly, by the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Statement of Regulatory Philosophy and Principles.

(a) The Regulatory Philosophy. Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

(b) The Principles of Regulation. To ensure that the agencies' regulatory programs are consistent with the philosophy set forth above, agencies should adhere to the following principles, to the extent permitted by law and where applicable:

(1) Each agency shall identify the problem that it intends to address (including, where applicable, the failures of private markets or public institutions that warrant new agency action) as well as assess the significance of that problem.

(2) Each agency shall examine whether existing regulations (or other law) have created, or contributed to, the problem that a new regulation is intended to correct and whether those regulations (or other law) should be modified to achieve the intended goal of regulation more effectively.

(3) Each agency shall identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

(4) In setting regulatory priorities, each agency shall consider, to the extent reasonable, the degree and nature of the risks posed by various substances or activities within its jurisdiction.

(5) When an agency determines that a regulation is the best available method of achieving the regulatory objective, it shall design its regulations in the most cost-effective manner to achieve the regulatory objective. In doing so, each agency shall consider incentives for innovation, consistency, predictability, the costs of enforcement and compliance (to the government, regulated entities, and the public), flexibility, distributive impacts, and equity.

(6) Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.

(7) Each agency shall base its decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and consequences of, the intended regulation.

(8) Each agency shall identify and assess alternative forms of regulation and shall, to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt.

(9) Wherever feasible, agencies shall seek views of appropriate State, local, and tribal officials before imposing regulatory requirements that might significantly or uniquely affect those governmental entities. Each agency shall assess the effects of Federal regulations on State, local, and tribal governments, including specifically the availability of resources to carry out those mandates, and seek to minimize those burdens that uniquely or significantly affect such governmental entities, consistent with achieving regulatory objectives. In addition, as appropriate, agencies shall seek to harmonize Federal regulatory actions with related State, local, and tribal regulatory and other governmental functions.

(10) Each agency shall avoid regulations that are inconsistent, incompatible, or duplicative with its other regulations or those of other Federal agencies.

(11) Each agency shall tailor its regulations to impose the least burden on society, including individuals, businesses of differing sizes, and other entities (including small communities and governmental entities), consistent with obtaining the regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations.

(12) Each agency shall draft its regulations to be simple and easy to understand, with the goal of minimizing the potential for uncertainty and litigation arising from such uncertainty.

Sec. 5. Existing Regulations.

In order to reduce the regulatory burden on the American people, their families, their communities, their State, local, and tribal governments, and their industries; to determine whether regulations promulgated

by the executive branch of the Federal Government have become unjustified or unnecessary as a result of changed circumstances; to confirm that regulations are both compatible with each other and not duplicative or inappropriately burdensome in the aggregate; to ensure that all regulations are consistent with the President's priorities and the principles set forth in this Executive order, within applicable law; and to otherwise improve the effectiveness of existing regulations:

(a) Within 90 days of the date of this Executive order, each agency shall submit to OIRA a program, consistent with its resources and regulatory priorities, under which the agency will periodically review its existing significant regulations to determine whether any such regulations should be modified or eliminated so as to make the agency's regulatory program more effective in achieving the regulatory objectives, less burdensome, or in greater alignment with the President's priorities and the principles set forth in this Executive order. Any significant regulations selected for review shall be included in the agency's annual Plan. The agency shall also identify any legislative mandates that require the agency to promulgate or continue to impose regulations that the agency believes are unnecessary or outdated by reason of changed circumstances.

(b) The Administrator of OIRA shall work with the Regulatory Working Group and other interested entities to pursue the objectives of this section. State, local, and tribal governments are specifically encouraged to assist in the identification of regulations that impose significant or unique burdens on those governmental entities and that appear to have outlived their justification or be otherwise inconsistent with the public interest.

(c) The Vice President, in consultation with the Advisors, may identify for review by the appropriate agency or agencies other existing regulations of an agency or groups of regulations of more than one agency that affect a particular group, industry, or sector of the economy, or may identify legislative mandates that may be appropriate for reconsideration by the Congress.

Appendix III: Crosswalk Between SIC Codes and NAICS Codes

SIC	SIC Description	NAICS	NAICS Description
1521	General Contractors-Single-Family Houses	233210	Single-Family Housing Construction
1522	General Contractors-Residential Construction not elsewhere classified	233220 233320	Multifamily Housing Construction Commercial and Institutional Building Construction
1541	General Contractors-Industrial Buildings and Warehouses	233310 233320	Manufacturing and Industrial Building Construction Commercial and Institutional Building Construction
1542	General Contractors-Nonresidential Buildings, Other than Industrial Buildings and Warehouses	233320	Commercial and Institutional Building Construction
1611	Highway and Street Construction, Except Elevated Highways	234110	Highway and Street Construction
1622	Bridge, Tunnel, and Elevated Highway Construction	234120	Bridge and Tunnel Construction
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction	234910 234920	Water, Sewer, and Pipeline Construction Power and Communication Transmission Line Construction
1629	Heavy Construction, NEC	234930 234990	Industrial Nonbuilding Structure Construction All Other Heavy Construction
1711	Plumbing, Heating, and Air-Conditioning	235110	Plumbing, Heating, and Air-Conditioning Contractors
1731	Electrical Work	235310	Electrical Contractors
1771	Concrete Work	235420 235710	Drywall, Plastering, Acoustical, and Insulation Contractors Concrete Contractors
1794	Excavation Work	235930	Excavation Contractors
1799	Special Trade Contractors, NEC	23592 235990	Glass and Glazing Contractors All Other Special Trade Contractors

Appendix IV: Working Safely in Trenches

OSHA Occupational Safety and Health Administration

Safety Tips

Working safely in trenches

Do NOT enter an unprotected trench!

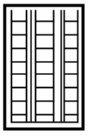
Each employee in a trench shall be protected from a cave-in by an adequate protective system.

Some of the protective systems for trenches are:

- Sloped for stability; or

- Cut to create stepped benched grades; or

- Supported by a system made with posts, beams, shores or planking and hydraulic jacks; or



- Supported by a trench box to protect workers in a trench.

Additionally, excavated or other materials must be at least 2 feet back from the edge of a trench; and

A safe means of egress shall be provided within 25 feet of workers in a trench.

For more complete information:

OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA

TTY (877) 889-5627

OSHA 3243-03R-05

OSHA Administración de Seguridad y Salud Ocupacional

Consejos de Seguridad

Trabajando de manera segura en una trinchera

¡NO entre en una trinchera que careza de protección!

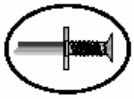
Todo empleado en una trinchera tiene que ser protegido de un derrumbe por un sistema de protección adecuado.

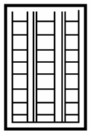
Algunos de los sistemas de protección para trincheras son:

- Inclinar para estabilidad, o

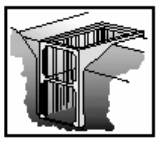
- Cortar para crear pasos o niveles escalonados, o

- Sostener por un sistema formado de postes, vigas, puntales o tablas con gatos hidráulicos, o





- Sostener por una caja de zanja que proteja a los trabajadores en la trinchera.



Además, los materiales excavados u otros materiales tienen que colocarse a un mínimo de 2 pies de la orilla de la trinchera y

Un medio seguro de salida tiene que ser colocado en una trinchera a un máximo de 25 pies de los trabajadores.

Para información más completa:

OSHA Administración de Seguridad y Salud Ocupacional

Departamento del Trabajo de los EE.UU.

www.osha.gov (800) 321-OSHA

TTY (877) 889-5627

HP Storm Pipe

HP Storm Pipe 12”–60” for Storm Applications

Overview

An addition to our proven line of pipe products, HP Storm is a high-performance polypropylene (PP) pipe for gravity-flow storm drainage applications. HP Storm is the perfect choice when premium joint performance and/or greater pipe stiffness is required. HP Storm couples advanced polypropylene resin technology with a proven, dual-wall profile design for superior performance and durability.

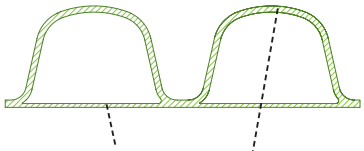
Specify HP Storm with confidence based on national standards and approvals. This innovative product meets or exceeds ASTM F2881 and AASHTO M330. From a federal perspective, polypropylene pipe is approved for use by the Army Corps of Engineers for storm drainage applications under Section 33 40 00 (Unified Facilities Guide Specifications). The Federal Aviation Authority (FAA) permits polypropylene pipe under airfield pavements per Item D-701, Pipe for Storm Drains and Culverts in AC 150/5370-10G (Standards for Specifying Construction of Airports). Additionally, the American Railway Engineering and Maintence-of-Way Association (AREMA) approves polypropylene pipe in storm drainage applications under railroads.

Advanced Dual Wall Profile Construction

HP Storm pipe utilizes an enhanced dual wall construction, providing increased pipe stiffness. The additional stiffness and beam strength enhances jobsite performance in stringent line and grade requirements. The pipe profile is completed with a smooth interior which provides additional strength and excellent flow characteristics.

Superior Polypropylene Material

Made from an engineered impact modified co-polymer compound, the superior strength and material properties of polypropylene offer robust pipe stiffness, excellent handling characteristics, and long service life when compared to traditional storm sewer products. It is highly resistant to chemical attack and is unaffected by soils or effluents with PH ranges 1.5 to 14. The unique light grey resin color provides immediate jobsite recognition as well as improving the pipe’s interior visibility during post-installation inspection.



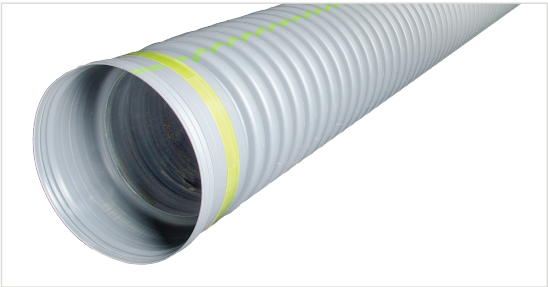
Smooth Interior Wall

Polypropylene Resin

Superior Joint Performance
HP Storm pipe has an extended bell that adds an additional factor of safety within each joint. The joint performance meets or exceeds the 10.8 psi laboratory performance standards per ASTM D3212 requirements. Third party certification of joint performance is available upon request.

In the field, each section of HP Storm may be tested by a low pressure air test, according to ASTM F1417, which is a commonly used standard and specifies that 3.5 psi air pressure be held for a specified length of time based upon pipe diameter and length of run.

Where an infiltration/exfiltration test is preferred, ASTM F2487 specifies a simplistic method of verifying proper joint performance.



Extended Bell

Fittings
Both standard and custom fittings are available for the HP Storm product line. A complete line of standard Nyloplast PVC molded fittings are available in the 12”–30” (300-750 mm) mainline sizes.

Standard branch laterals are designed to accept SDR-35 or SDR-26 pipe.

Fabricated Wye Fitting

Diameter Range
HP Storm is currently manufactured in the 12”–60” (300-1500mm) size range and in 20-foot (6m) lengths. The 20-foot (6m) lengths aid in speed of installation and reduce the total number of joints.

Diameter in (mm)	Profile Type	Length ft (m)	Inside Diameter in (mm)	Outside Diameter in (mm)	Truckload Footage ft (m)
12 (300)	Dual Wall	20 (6)	12.2 (310)	14.5 (368)	2,400 (731.5)
15 (375)	Dual Wall	20 (6)	15.1 (384)	17.7 (450)	1,600 (487.7)
18 (450)	Dual Wall	20 (6)	18.2 (462)	21.4 (544)	1,120 (341.4)
24 (600)	Dual Wall	20 (6)	24.1 (612)	28.0 (711)	600 (182.9)
30 (750)	Dual Wall	20 (6)	30.2 (767)	35.5 (902)	360 (109.7)
36 (900)	Dual Wall	20 (6)	36.0 (914)	41.5 (1054)	240 (73.2)
42 (1050)	Dual Wall	20 (6)	42.0 (1067)	47.4 (1204)	160 (48.8)
48 (1200)	Dual Wall	20 (6)	47.9 (1217)	54.1 (1374)	120 (36.6)
60 (1500)	Dual Wall	20 (6)	59.9 (1521)	67.1 (1704)	80 (24.4)

Tap Connections

A standard tapping product, such as Inserta Tee®, is compatible with HP Storm.

Repair Couplers

Depending on local requirements, ADS offers a full range of repair coupling options. For soil-tight performance, split couplers and Mar Mac® repair bands are offered. Testable repair couplers are also available, which include stainless steel restraint bands and Nyloplast® PVC repair sleeves.

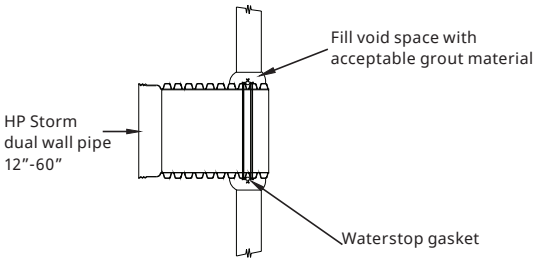
12”–60” Structure Connections

Storm sewer structure connection requirements vary greatly by region. For soil-tight performance, HP Storm exterior corrugations provide an effective profile for grouted connections. For watertight performance, ADS offers a selection of options utilizing some of the most widely used manhole connectors from companies such as A-Lok®, Trelleborg® and Press Seal® Gasket Corporation.

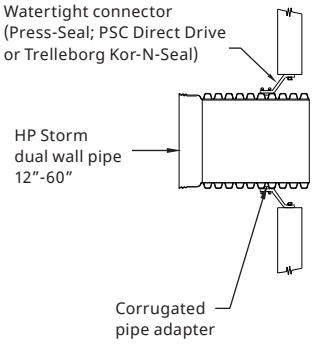
Typical Inserta Tee Tap

Repair Coupler

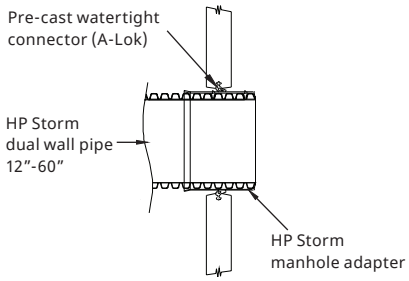
Grouted Waterstop Manhole Connection



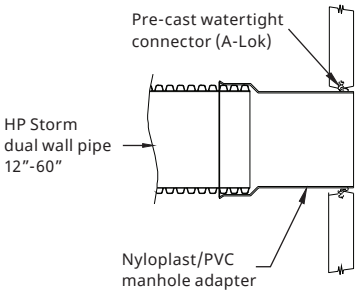
Flexible Boot Connection



Pre-Cast Compression Gasket Connection



Pre-Cast Compression Gasket Connection



ADS HP Storm 12”–60” Pipe Specification

Scope

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

Pipe Requirements

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

Joint Performance

Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2881.

12– through 60–inch (300 to 1500 mm) shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting 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 joint 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 and AASHTO M330. Bell and spigot connections shall utilize a spun–on, welded or integral bell and spigots with gaskets meeting ASTM F477. Bell & spigot fittings joint shall meet the watertight joint performance requirements of ASTM D3212. Corrugated couplings shall be split collar, engaging at least 2 full corrugations.

Field Pipe and Joint Performance

To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F1417 or 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) diameters, the minimum cover shall be 2 feet (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1, 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.ads–pipe.com for a copy of the latest installation guidelines.

Pipe Dimensions

Nominal Diameter 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 at 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 maximum values.

adspipe.com

800-821-6710

ADS HP STORM 12”- 60” PIPE SPECIFICATION

Scope

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

Pipe Requirements

ADS 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.ads-pipe.com for a copy of the latest installation guidelines.

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.

TECHNICAL NOTE

Minimum and Maximum Cover Heights for HP Storm Pipe for Storm Drainage

TN 2.04
March 2018

Introduction

The information in this document is designed to provide answers to general cover height questions; the data provided is not intended to be used for project design. The design procedure described in the *Structures* section (Section 2) of the Drainage Handbook provides detailed information for analyzing most common installation conditions. This procedure should be utilized for project specific designs.

The two common cover height concerns are minimum cover in areas exposed to vehicular traffic and maximum cover heights. Either may be considered "worst case" scenario from a loading perspective, depending on the project conditions.

Minimum Cover in Traffic Applications

Pipe diameters from 12- through 48-inch (300-1200 mm) installed in traffic areas (AASHTO H-20, H-25, or HL-93 loads) must have at least one foot (0.3m) of cover over the pipe crown, while 60-inch (1500 mm) pipes must have at least 24 inches (0.6m) of cover. The backfill envelope must be constructed in accordance with the *Installation* section (Section 5) of the Drainage Handbook and the requirements of ASTM D2321. The backfill envelope must be of the type and compaction listed in Appendix A-5, Table A-5-2 of the Drainage Handbook. In Table 1 below, this condition is represented by a Class III material compacted to 95% standard Proctor density or a Class II material compacted to 90% standard proctor density, although other material can provide similar strength at slightly lower levels of compaction. Structural backfill material should extend to the crown of the pipe; the remaining cover should be appropriate for the installation and as specified by the design engineer. If settlement or rutting is a concern, it may be appropriate to extend the structural backfill to grade. Where pavement is involved, sub-base material can be considered in the minimum burial depth. While rigid pavements can be included in the minimum cover, the thickness of flexible pavements should not be included in the minimum cover.

Additional information that may affect the cover requirements is included in the *Installation* section (Section 5) of the Drainage Handbook. Some examples of what may need to be considered are temporary heavy equipment, construction loading , paving equipment and similar loads that are less than the design load, the potential of pipe flotation, and the type of surface treatment which will be installed over the pipe zone.

Table 1
Minimum Cover Requirements for ADS HP Storm with AASHTO H-25, H-20, or HL-93 Load

Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)
12 (300)	1 (0.3)
15 (375)	1 (0.3)
18 (450)	1 (0.3)
24 (600)	1 (0.3)
30 (750)	1 (0.3)

Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)
36 (900)	1 (0.3)
42 (1050)	1 (0.3)
48 (1200)	1 (0.3)
60 (1500)	2 (0.6)

Notes:

1. *Minimum covers presented here were calculated assuming Class III backfill material compacted to 95% standard Proctor density or Class II backfill material compacted to 90% standard Proctor density around the pipe, as recommended in Section 5 of the Drainage Handbook, with an additional layer of compacted traffic lane sub-base for a total cover as required. In shallow traffic installations, especially where pavement is involved, a good quality compacted material to grade is required to prevent surface settlement and rutting.*
2. *The minimum covers specified do not include pavement thickness. A pavement section of 0.4' is typical.*
3. *Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.*
4. *Calculations assume no hydrostatic pressure and native soils that are as strong as the specified minimum backfill recommendations.*

Maximum Cover

Wall thrust generally governs the maximum cover a pipe can withstand and conservative maximum cover heights will result when using the information presented in the *Structures* section (Section 2) of the Drainage Handbook. Table 2 below shows the material properties consistent with the expected performance characteristics for HP Storm materials for a 100-year design life.

The maximum burial depth is highly influenced by the type of backfill and level of compaction around the pipe. General maximum cover limits for ADS HP Storm use in storm drainage applications are shown in Tables 3 for a variety of backfill conditions.

Table 3 was developed assuming pipe is installed in accordance with ASTM D2321 and the *Installation* section (Section 5) of the Drainage handbook. Additionally, the calculations assume no hydrostatic load around the pipe, incorporate the maximum conservative AASHTO LRFD design factors represented in *Structures* section of the Drainage Handbook, use material properties consistent with the expected performance characteristics for HP Storm materials, as shown in Table 2, and assume the native (in-situ) soil is of adequate strength and suitable for installation. For applications requiring fill heights greater than those shown in Table 3 or where hydrostatic pressure due to groundwater is expected, contact an ADS Engineer.

Table 2
ADS HP Storm Mechanical Properties

Resin	ASTM Specification	Allowable Long Term Strain %	Initial		75-Year	
			Fu (psi)	E (psi)	Fu (psi)	E (psi)
Polypropylene, Impact-modified copolymer	ASTM F2881	3.7	3,500	175,000	1,000	28,000

Figure 1
ADS HP Storm Pipe Trench Detail with Uniform Backfill
(Traffic and Non-Traffic Applications)

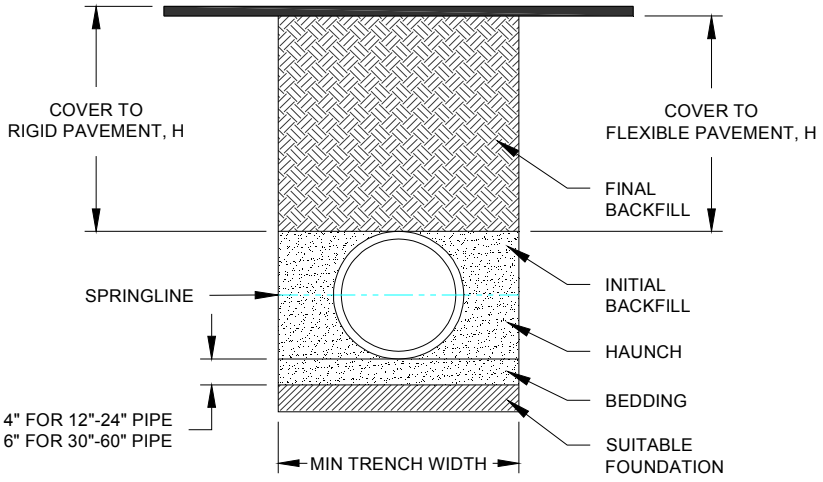


Table 3
Maximum Cover for ADS HP Storm Pipe with Uniform Backfill, ft (m)

Diameter	Class 1		Class 2			Class 3		Class 4
in (mm)	Compacted	Dumped	95%	90%	85% [3]	95%	90% [3]	95% [3]
12 (300)	41 (12.5)	21 (6.4)	28 (8.5)	21 (6.4)	16 (4.9)	20 (6.1)	16 (4.9)	16 (4.9)
15 (375)	42 (12.8)	21 (6.4)	29 (8.8)	21 (6.4)	16 (4.9)	21 (6.4)	16 (4.9)	16 (4.9)
18 (450)	44 (13.4)	21 (6.4)	30 (9.1)	21 (6.4)	16 (4.9)	22 (6.7)	17 (5.2)	16 (4.9)
24 (600)	37 (11.3)	18 (5.5)	26 (7.9)	18 (5.5)	14 (4.3)	19 (5.8)	14 (4.3)	14 (4.3)
30 (750)	39 (11.9)	19 (5.8)	27 (8.2)	19 (5.8)	14 (4.3)	19 (5.8)	15 (4.6)	14 (4.3)
36 (900)	28 (8.5)	14 (4.3)	20 (6.1)	14 (4.3)	10 (3.0)	14 (4.3)	11 (3.4)	10 (3.0)
42 (1050)	30 (9.1)	14 (4.3)	21 (6.4)	14 (4.3)	10 (3.0)	15 (4.6)	11 (3.4)	10 (3.0)
48 (1200)	29 (8.8)	14 (4.3)	20 (6.1)	14 (4.3)	9 (2.7)	14 (4.3)	10 (3.0)	10 (3.0)
60 (1500)	29 (8.8)	14 (4.3)	20 (6.1)	14 (4.3)	9 (2.7)	14 (4.3)	10 (3.0)	9 (2.7)

Notes:

1. *Results based on calculations shown in the Structures section of the ADS Drainage Handbook (v20.7). Calculations assume no hydrostatic pressure and a density of 120 pcf (1926 kg/m^3) for overburden material.*
2. *Installation assumed to be in accordance with ASTM D2321 and the Installation section of the Drainage Handbook.*
3. *For installations using lower quality backfill materials or lower compaction efforts, pipe deflection may exceed the 5% design limit; however controlled deflection may not be a structurally limiting factor for the pipe. For installation where deflection is critical, pipe placement techniques or periodic deflection measurements may be required to ensure satisfactory pipe installation.*
4. *Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.*
5. *Material must be adequately "knifed" into haunch and in between corrugations. Compaction and backfill material is assumed uniform throughout entire backfill zone.*
6. *Compaction levels shown are for standard Proctor density.*
7. *For projects where cover exceeds the maximum values listed above, contact ADS for specific design considerations.*
8. *See ADS Standard Detail STD-101D for additional details.*

TECHNICAL NOTE

HP Storm Drainage Pipe Repair Options

TN 5.12
September 2015

Introduction

ADS HP STORM for storm drainage is made of polypropylene (PP) resin making the pipe lightweight and very easy to handle. The attributes that make the pipe easy to use can also make it easy to abuse, resulting in damaged pipe or joints. This technical note discusses some of the products available that can be used to repair damaged PP pipe or joints in the field.

Repair Options

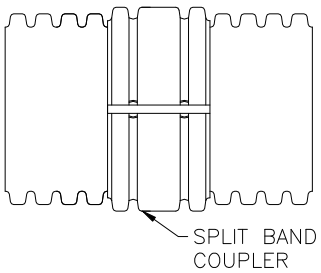
One of the primary considerations in selecting a repair method is the degree of joint performance required. Watertight repairs are generally used on pipe with watertight joints, and soil-tight repairs on pipe with soil-tight joints. This helps keep costs in line and prevents the repair from being the weak area of the pipe system.

The way in which a pipe can be accessed is another primary consideration which influences what type of repair alternative is selected. Pipe that is not yet buried, or can be easily excavated, can be repaired from the exterior. If the pipe is buried and cannot be conveniently excavated, an internal repair may be the best alternative. If the pipe is too small to enter, there are companies with remote controlled equipment that can install the product. Each situation must be considered individually.

The repair options addressed below are divided into external repairs and internal repairs. During any pipe repair, backfill should be placed and compacted per project specifications to provide proper support for the pipe and coupler.

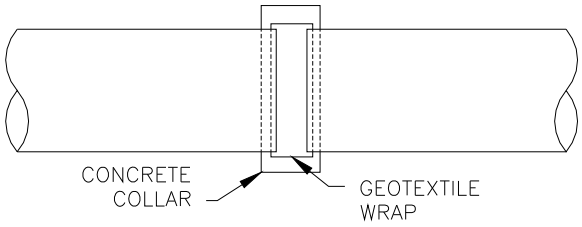
External Mechanical Repairs

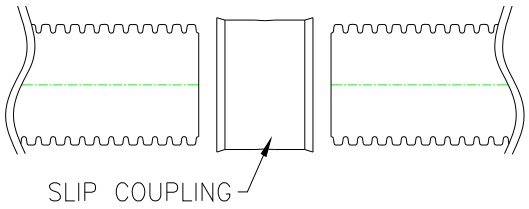
Mar Mac Polyseal Pipe Coupler, 12- through 60-inch (300 - 1500 mm), consists of a mastic adhesive base layer, a cross-laminated polyethylene middle layer with a spun-bonded geotextile polypropylene cloth outer layer. The coupler incorporates self-adhering rubberized bonding mastic and securing bands to insure a positive seal around the pipe. If the pipe itself is damaged, the damaged area will need to be removed and a new pipe section spliced in before installing a coupler around both ends. Polyseal Pipe Couplers are reasonably priced, especially when considering the quality of the finished repair, and are typically used with soil-tight smooth interior thermoplastic pipe products. *Note: Mar-Mac bands shall be installed in accordance with manufacturer's recommendations.*



Split band couplers, 12- through 60-inch (300 – 1500 mm), will provide a soil-tight repair with or without gaskets. Split band couplers engage the exterior corrugations and therefore can only be used for corrugated exterior pipe. This repair method should only be used if the damaged area is in a non-trafficked green area, is cosmetic in nature, confined to a single corrugation, and is not defined as structural damage. The coupler shall be centered over the damaged area of pipe and tightened down with the nylon straps. If the damaged area is large or significant, the damaged area is to be cut out, and replaced with a new section of pipe. The replacement section is to be 'spliced' in place using split band couplers. They are a convenient, low-cost repair alternative, and are typically used to repair soil-tight thermoplastic pipe products with a corrugated exterior.

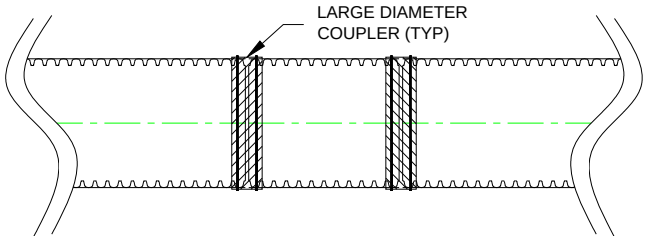
Concrete collars also provide a soil-tight repair, dependent on the integrity of the installation. Installing a concrete collar involves building a form around the area to be repaired and encasing it in concrete. A geotextile is usually wrapped around the repair area prior to pouring the collar to keep the concrete from seeping into the pipe. Typically, approximately 6" (0.15m) is excavated beneath the pipe to allow for proper application of the geotextile and concrete encasement. If the pipe itself is damaged, the damaged area shall be removed and a replacement pipe section spliced in prior to pouring the collar. In order to provide a greater level of joint performance, a gasket can be installed on the pipe in the concrete encasement. Concrete collars are typically more costly and time consuming than snap couplers or split band couplers but are reasonable repair options for soil-tight smooth interior thermoplastic pipe products. .





Slip Couplings 12- through 30-inch (300 – 750 mm), provides a watertight repair that will meet most pressure testing requirements, when installed correctly. The slip coupling uses PVC bells with gaskets. The gaskets are placed in the valleys on either side of the section to be repaired and slip couplings are then slid over the gaskets. Due to the exterior gasket, the slip coupling can only be used on pipe with a corrugated exterior. PVC slip couplings are most commonly used with watertight smooth interior, corrugated exterior thermoplastic pipe products.

Large Diameter Repair Coupler 12- through 60-inch (300 – 1500 mm) are ideal for repairs and alterations of large diameter pipe. Repair couplers similar to those provided by Mission Rubber Company LLC, Fernco® or equal may be used on HP Storm pipe. The couplers are used by removing the damaged section of pipe, replacing it with a new section and then sliding the coupler back around the joint, similar to the slip coupling above. The couplers stainless steel bands are then tightened to the manufactures recommendations. These rubber couplings are capable of meeting watertight field test requirements when installed per manufacturer's recommendations.



Internal Repairs

Internal mechanical repair products generally consist of a flexible cylindrical gasket sleeve, which is expanded to conform to the inner wall of the pipe. The feasibility of this repair method depends on the size of the damaged section or joint and available access into the pipe. Internal mechanical seals slightly restrict the inside diameter of the pipe. This should be considered when assessing the risk of debris obstruction.

NPC Internal Joint Seal, 18- through 60-inch (450 – 1500 mm), consists of an EPDM rubber seal and stainless steel bands. The rubber seal is inserted into the pipe and positioned over the joint. A torque wrench is used to expand the bands against the inner wall of the pipe. The Internal Joint Seal is designed to seal joints – not

repair damaged pipe sections. The damaged area of the pipe must be removed and a replacement section spliced in if necessary in order to use the Internal Joint Seal. This system may provide a watertight joint when installed as recommended. The manufacture should be contacted to verify the product meets the specific application requirements including test requirements, if specified. If pressure tests are required, NPC should be contacted to ensure that the product is suitable for the specific test criteria.

Internal mechanical seals will slightly restrict the inside diameter of the pipe. This should be considered when assessing the risk of debris obstruction.

Link Pipe Grouting Sleeve™, 12- through 60-inch (100 – 1500 mm), is a stainless steel grouting sleeve that is installed with an inflatable plug. The sleeve may be used to seal a joint or repair short sections of damaged pipe. The manufacture should be contacted to verify the product meets the specific application requirements including test requirements, if specified.

Internal chemical sealing is another method of internal joint repair using chemically activated gel or grout to minimize joint leakage. The grout is typically applied with specialized remote-controlled equipment. Test/seal packer is used to remotely seal a joint. The grouting chemicals are forced through the joint out into the surrounding soil where they gel with the soil. The gelled mass forms a waterproof collar around the pipe. The result is significantly reduced leakage. There are several types of chemical grouts available and the manufacturer should be contacted to review the specific situation and any joint tightness or pressure test criteria. Companies such as Avanti International, Strata Tech Inc., and Carylon Corporation manufacture and/or install chemical grout. Stephen's Technologies *New Life Coatings* and *NewLife Liner Systems* as well as Avast Hydro-Lining International, are examples of companies that offer cured in place epoxy lining systems that have been effectively used with HDPE pipe. Most pipe diameters can be chemically grouted provided the grouting contractor has the appropriate equipment.

Manufacturer Contact Information

Contact the Regional Engineer or Application Engineering Department for assistance with other unique conditions or for contact information regarding any companies listed in this technical note.

Note: Thermoplastic pipe products are solely intended for the conveyance of fluids. Access into this product for maintenance, inspection, repair, or other reason should be done in strict accordance with OSHA recommendations for confined space entry.

TECHNICAL NOTE

Post Installation Testing of HP Storm

TN 5.20
August 2016

Introduction

Storm sewer is often tested after or during installation to ensure a sound installation was accomplished. Types of post installation field testing include deflection testing and joint testing. Specific testing required for the project will be found in the project specifications. This technical note is not meant to supersede any project specification, but should be used in conjunction with the project specification and national testing standards as it relates specifically to HP Storm pipe.

Deflection Testing

An important feature of any flexible pipe is its ability to deflect, or oval, under load without structural distress. Deflection allows the load to be transferred from the pipe to the surrounding backfill. The result is flexible pipe can withstand very high loads as a relatively light structure. Flexible pipe – including HP Storm – *must* deflect in order to mobilize the strength of the surrounding backfill.

According to current thermoplastic design procedures, deflection is defined as a service limit. The designer, considering all site conditions, will set this service limit in order to perform a proper design evaluation. Deflection in excess of this service limit does not necessarily result in strength limits being exceeded, i.e. system failure. For more information on service and strength limit states, see the *Structures* section of the Drainage Handbook. HP Storm can be expected to perform satisfactorily in most applications with 5% or 7.5% deflection and so it is typical of designers to choose a service limit in this range.

When testing for allowable deflection limits, the minimum inside diameter should be used when establishing mandrel sizing. The minimum inside diameter accounts for the allowable manufacturing tolerances. Table 1 lists the inside diameters that result from 5% and 7.5% deflection from the minimum inside diameter. Values listed in Table 1 should be used for sizing mandrels for deflection testing. Mandrels may be obtained from a variety of commercial suppliers.

Table 1
HP Storm Recommended Mandrel Settings

Pipe Type	Pipe Diameter	Minimum Inside Diameter*	Inside Diameter with 5% Deflection	Inside Diameter with 7.5% Deflection
Dual Wall	12	11.88	11.29	10.99
	15	14.78	14.11	13.74
	18	17.82	16.93	16.48
	24	23.76	22.57	21.98
	30	29.70	28.22	27.47
	36	35.64	33.86	32.97
	42	41.58	39.50	38.46
	48	47.52	45.14	43.96
	60	59.40	56.43	54.95

* Value is the larger of ASTM F2881 and AASHTO M330. If designing to a specific standard, please review allowable minimum diameter

It is important to understand that mandrel testing is a go/no-go test. If any line were to not pass a mandrel, it is important to ascertain the cause. Obstructions in the line, not associated with deflection, may influence the test. Visual inspection is recommended in the event of a no-go result.

Joint Testing

Joint testing is an important part of any gravity sewer system, both in testing for infiltration and exfiltration. Infiltration aids to estimate the amount of sewer water that will be conveyed to, and ultimately treated by, the waste water treatment plant. Exfiltration aids to estimate the loss of sewage water into the surrounding soil. The two primary ways of testing sewer pipe joints for infiltration and/or exfiltration is using air or water to create a constant pressure within the system.

Exfiltration Testing with Air

Air is a compressible gas and so it is extremely important one adheres to the appropriate safety regulations outlined in OSHA and project specifications. There are two primary national testing standards that may be applied to joint testing HP Storm: ASTM F1417 *Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air*, and ASTM F3058 *Preliminary Field Testing of Thermoplastic Pipe Joints for Gravity Flow (Non-Pressure) Sewer Lines*. When either standard is specified by the project plans, one should review the standards carefully and follow the testing procedure and safety precautions outlined. The below commentary on the ASTM testing procedures should be considered a summary and does not replace the testing procedures outlined in their respective specifications.

ASTM F1417 entails testing a run of pipe from one manhole to the next adjacent manhole. Inflatable plugs are positioned into the manholes and secured. Air is introduced into the pipe line and gradually builds pressure. Once the line has been pressurized and is stable at 4.0-psi, the pressure is decreased to 3.5-psi at which time the line must not lose more than 0.5- or 1.0-psi (whichever is specified by the design engineer) in the specified amount of time. Table 2 below summarizes the minimum time that must be reached for less than 0.5- or 1.0-psi of pressure drop, depending on the diameter and length of pipe being tested.

Table 2
Time to Pressure Drop for HP Storm (per ASTM F1417)

Pipe Diameter	Pressure Drop (psi)	Minimum Test Time (min:sec)	Length for Minimum Time, (ft)	Time for Longer Lengths, (sec)	Time for Length Shown, (min:sec)							
					100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
12	0.5	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
	1.0	11:20		3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	0.5	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
	1.0	14:10		5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	0.5	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
	1.0	17:00		7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	0.5	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
	1.0	22:40		13.764 L	22:47	34:11	43:34	56:58	68:22	79:46	91:10	102:33
30	0.5	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
	1.0	28:20		21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

Data taken from ASTM F 1417[1] and Uni-Bell, Uni-B-6-98[3].
It may not be necessary to hold the test for the entire time period listed above when it is evident that the rate of air loss is zero or less than the allowable pressure drop and authorized by the approving authority[1].

When the pipe is large enough to be physically accessed, it may be desirable to test individual joints for safety reasons. In these cases, one may consider joint testing in accordance with ASTM F3058, also known as a joint isolation test. ADS recommends a joint isolation test, in lieu of a full line test, for testing pipe diameters 36” and larger for safety reasons. This test is typically done with air, though water may also be used, and involves the use of special testing equipment. The equipment consists of two inflatable bladders, placed on each side of the joint, creating an open center cavity between them. The bladders are inflated and then the center cavity is pressurized to 3.5 psi. The joint passes the test if the pressure is held for 5 seconds without dropping more than 1.0-psi. For all practical purposes, this is a go/no-go test. Final acceptance of the pipeline per this testing method shall be at the discretion of the Design Engineer. One

advantage of this type of test is the ability for the installer to quickly test the joint immediately after installation, allowing for any corrective measures to be taken early on in the project.

Infiltration/Exfiltration with Water

Testing gravity sewer joints via water infiltration or exfiltration is a common practice. For HP Storm, this testing should be conducted in accordance with ASTM F2487 *Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines*. These standards entail first observing the ground water conditions and, if applicable, measuring the infiltration rate of the ground water through the joints. If ground water is not applicable, then the line is filled with water and the leakage is observed through exfiltration.

Manholes shall be tested separately and independently of the pipe line to the requirements established in the project specifications. When water level is measured in the manhole for the exfiltration test, the leakage associated with the manhole shall be subtracted from the overall leakage of the test section to establish a pass or fail grade for the pipe.

Allowable Leakage

The allowable leakage rate for HP Storm is 100 gallons/in-dia/mi-pipe/day for both infiltration and exfiltration when done in accordance with ASTM F2487.

Conclusion

ADS HP Storm is intended for gravity flow storm sewer applications and may be tested for deflection and joint tightness as discussed in this technical document. It is important to note that the testing procedures are no different than for other storm sewer products currently being used in the market. This document does not purport to address the safety concerns associated with testing HP Storm. Any questions associated with testing HP Storm can be directed to your local representative.

References

1. ASTM F1417, *Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air*, ASTM, 2005
2. *F3058, Preliminary Field Testing of Thermoplastic Pipe Joints for Gravity Flow (non-Pressure) Sewer Lines*, ASTM, 2016.
3. Uni-B-6-98, *Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe,* Uni-Bell PVC Pipe Association, 1998
4. ASTM F2487, *Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines,* ASTM, 2006
5. ASTM F2881, *Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications*, ASTM, 2011

SECTION M-5 - PIPE INITIAL BACKFILL AND EMBEDMENT

DESCRIPTION

M5-1.1 This section covers the furnishing of all labor, equipment, and materials necessary for placing pipe as required on the Plans or as deemed necessary by the Engineer.

MATERIALS

M5-2.1 Materials for pipe initial backfill and embedment shall be as follows:

M5-2.1.1 Installed pipe shall be initially backfilled and bedded in No. 57 stone, or an approved equal meeting the following gradation:

Sieve (Square Opening)	Percent Passing
1 ½"	100
1"	95-100
½"	25-60
#4	0-10
#8	0-5

Note: Stone backfill and embedment shall be stockpiled and placed in such a manner that foreign material will not be included in the complete embedment section.

CONSTRUCTION METHODS

M5-3.1 Initial backfill and embedment will be required for new storm drainage pipe as shown on the plans. The excavated trench for pipe installation shall be inspected by the Engineer and deemed acceptable for pipe placement. Bedding under storm drainage pipe will be constructed at the specified thickness below bottom of proposed pipe. The width of the pipe embedment shall extend the full width of the trench bottom as shown in the plans, but not beyond the maximum trench width. The Contractor will not be paid for extra bedding placed in trenches that are excessive in width and/or exceed the limits shown in the plans.

M5-3.3 Additional excavation will be required in soft, mucky areas where the specified bedding will not adequately support the pipe or inlets. Where such areas as determined by the Engineer are excavated, the additional depth of trench shall be backfilled with additional No. 57 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

M5-4.1 Pipe initial backfill and embedment 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 pipe installation pay items.

END OF SECTION M-5

SECTION I-14 – TOPSOIL

DESCRIPTION

I14-1.1 This section covers the furnishing and placing topsoil as shown on the Plans or as described by the Engineer.

STANDARDS

I14-2.1 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

I14-3.1 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

I14-4.1 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 I-14

SECTION I-13 – SOLID SODDING

DESCRIPTION

I13-1.1 This section covers the furnishing and placing of approved zoysia sod, fertilizer, and water to form solid mats on areas shown on the Plans or as directed by the Engineer.

STANDARDS

I13-2.1 Materials and work shall be in accordance with SECTION 624 – SOLID SODDING of the Standard Specifications, except as herein modified or augmented.

CONSTRUCTION METHODS

I13-3.1 Areas to be sodded shall be shaped and graded to an elevation in such manner that they will, after placement of sod, conform to details shown in the plans.

I13-3.2 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

I13-4.1 Areas covered by living sod completed and accepted will be measured by the square yard to the nearest square yard.

BASIS OF PAYMENT

I13-5.1 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 I-13

STONE LINKS SUBDIVISION
MULTI-PIPE MAINTENANCE REHABILITATION

NORTH LITTLE ROCK, AR

MAY 2021

INDEX OF SHEETS	
SHEET	TITLE
1	COVER SHEET
2-10	EXISTING PLANS INFO. (STONE LINKS PHASE 1)
11	PLASTIC PIPE BEDDING DTLS.

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

STONE LINKS SUBDIVISION
MULTI-PIPE MAINTENANCE REHABILITATION

COVER SHEET

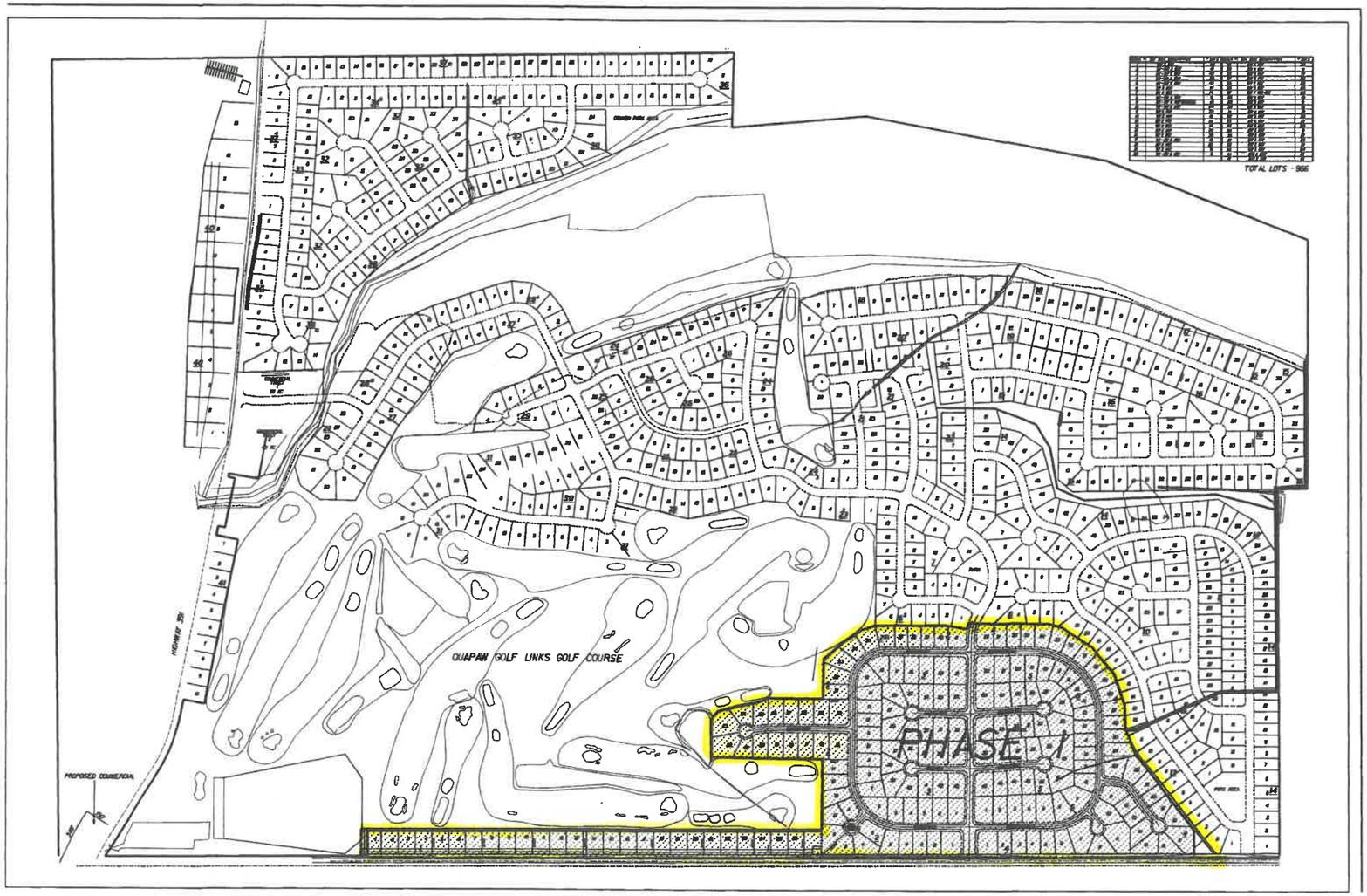
DATE:	5/2021
DESIGNED BY:	MCK
DRAWN BY:	MCK
SCALE:	NONE

SHEET NUMBER
1

PHASE I - CONSTRUCTION PLANS FOR

SEWER, WATER, STREET AND DRAINAGE IMPROVEMENTS

FOR



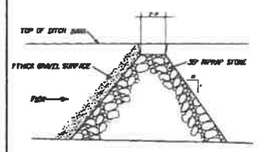
STONE LINKS

AN ADDITION TO THE CITY OF NORTH LITTLE ROCK, PULASKI COUNTY, ARKANSAS

OWNER
QUAPAW DEVELOPMENT COMPANY, INC.

ENGINEER
MARLAR ENGINEERING COMPANY, INC.

INDEX



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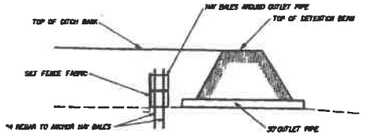
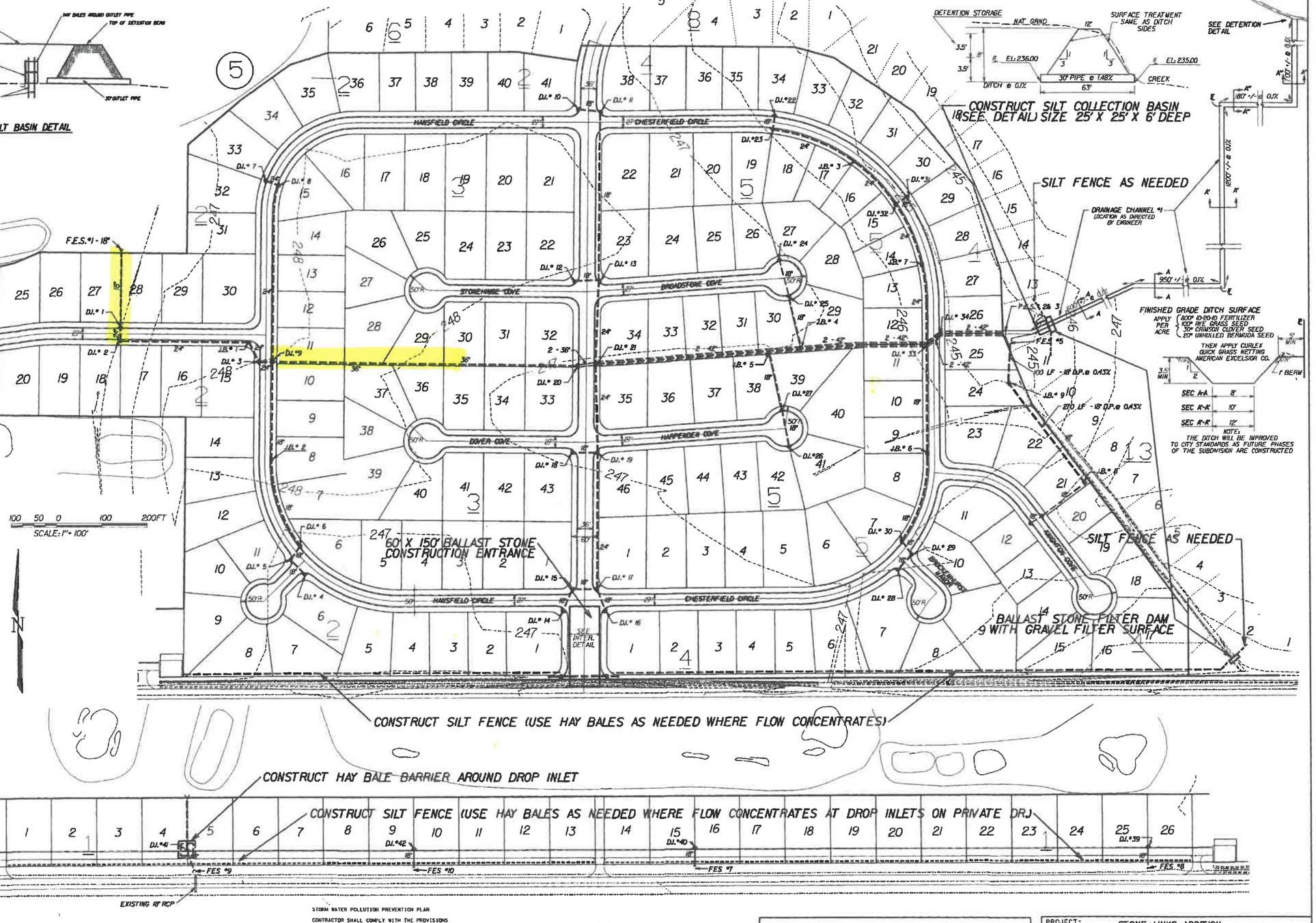


SILT BASIN DETAIL



DRAINAGE DATA

STRUCTURE	C	Q25	A	Q25	Q100	C100	TOP ELEV	FLOW LINE ELEV
F.E.S. #1	0.5	3.0	3.0	6.6	4.3	7.8	----	344.35
D.I. #1	0.5	2.0	5.5	6.5	4.3	12.9	345.88	341.70
D.I. #2	0.5	2.0	5.0	10.0	4.3	18.1	345.36	341.97
D.I. #3	----	----	----	----	----	----	345.40	340.97
D.I. #4	0.5	3.0	6.5	11.1	4.3	19.2	347.00	342.97
D.I. #5	----	----	----	----	----	----	347.00	342.97
D.I. #6	0.5	4.3	0.5	2.2	6.2	2.3	346.12	342.50
D.I. #7	0.5	4.3	1.5	6.5	6.2	7.1	348.50	343.77
D.I. #8	0.5	4.3	3.5	15.1	6.2	16.6	348.50	343.77
D.I. #9	----	----	----	----	----	----	347.00	342.97
D.I. #10	0.5	4.3	0.5	2.2	6.2	2.3	347.50	342.97
D.I. #11	0.5	4.3	1.5	6.5	6.2	7.1	348.50	343.77
D.I. #12	0.5	4.3	3.5	15.1	6.2	16.6	348.50	343.77
D.I. #13	0.5	4.3	0.7	17.2	6.2	19.9	349.03	344.22
D.I. #14	0.5	5.0	0.5	2.7	7.0	3.0	347.50	342.79
D.I. #15	0.5	4.3	2.0	8.7	6.2	9.5	349.50	343.97
D.I. #16	0.5	5.0	4.3	31.1	7.0	34.4	349.40	343.22
D.I. #17	0.5	4.3	5.5	16.5	6.2	25.1	349.50	344.80
D.I. #18	0.5	4.3	2.1	8.4	6.2	9.6	348.40	343.80
D.I. #19	0.5	4.3	5.6	17.0	6.2	24.6	350.40	345.70
D.I. #20	0.5	3.0	20.5	27.1	4.3	81.8	345.85	340.10
D.I. #21	0.5	3.0	19.5	30.0	4.3	86.4	345.50	340.01
D.I. #22	0.5	4.3	1.0	4.5	6.2	4.7	344.45	341.52
D.I. #23	0.5	4.3	3.3	9.5	6.2	13.2	344.45	341.86
D.I. #3A	----	----	----	----	----	----	345.75	341.34
D.I. #24	0.5	4.3	1.1	2.8	6.2	4.1	345.20	342.45
D.I. #25	0.5	4.3	3.1	8.5	6.2	12.2	345.20	342.58
D.I. #4A	----	----	----	----	----	----	346.80	338.83
D.I. #26	0.5	4.3	1.1	2.8	6.2	4.1	345.20	342.45
D.I. #27	0.5	4.3	3.5	7.7	6.2	11.3	345.20	341.70
D.I. #5A	----	----	----	----	----	----	9.50	334.80
D.I. #28	0.5	5.0	0.5	2.7	7.0	3.0	345.60	342.79
D.I. #29	0.5	4.3	1.7	6.4	6.2	9.5	348.20	343.70
D.I. #30	0.5	4.3	3.5	8.5	6.2	12.2	348.20	343.77
J.B. #1	----	----	----	----	----	----	350.50	345.97
D.I. #31	0.5	3.0	8.9	27.1	4.3	38.9	344.50	340.04
D.I. #32	0.5	4.3	1.1	4.4	6.2	4.5	344.20	340.78
J.B. #7	----	----	----	----	----	----	345.00	340.97
D.I. #33	0.5	3.0	44.9	73.9	4.3	188.6	344.20	339.20
D.I. #34	0.5	3.0	48.0	73.8	4.3	170.1	341.80	338.46
F.E.S. #2	----	----	----	----	----	----	----	339.05
D.I. #35	0.5	4.3	1.8	4.5	6.2	8.1	344.90	341.80
D.I. #36	0.5	4.3	3.2	9.3	6.2	13.2	344.50	341.97
J.B. #8	----	----	----	----	----	----	347.90	340.77
J.B. #9	----	----	----	----	----	----	342.50	340.77
F.E.S. #5	----	----	----	----	----	----	----	338.20
F.E.S. #3	0.5	4.3	7.4	18.1	6.2	27.3	----	344.20
D.I. #37	0.5	4.3	7.4	16.1	6.2	24.3	348.50	343.70
D.I. #38	0.5	4.3	7.1	19.4	6.2	27.8	348.50	343.48
F.E.S. #4	----	----	----	----	----	----	----	343.15
D.I. #39	0.5	4.3	1.2	3.1	6.2	4.5	348.50	343.72
J.B. #6	----	----	----	----	----	----	----	344.80
D.I. #40	0.5	4.3	2.7	3.8	6.2	5.3	348.50	343.50
F.E.S. #7	----	----	----	----	----	----	----	344.79
D.I. #41	0.5	4.3	1.5	5.8	6.2	8.1	345.50	340.80
F.E.S. #8	----	----	----	----	----	----	----	339.80
D.I. #42	0.5	4.3	1.2	3.1	6.2	4.4	348.50	343.51
F.E.S. #10	----	----	----	----	----	----	----	342.50

STORM WATER POLLUTION PREVENTION PLAN

CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF ACT 472 OF 1949, AS AMENDED, ARKANSAS ANN. 8-4-101 AND THE CLEAN WATER ACT (33 U.S.C. 1251).

THE CONTRACTOR SHALL:

1. KEEP A COPY OF STORMWATER POLLUTION PREVENTION PLAN ON JOB SITE AT ALL TIMES.
2. FILE A NOTICE OF INTENT (NOI) WITH THE ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY (ADPCE).
3. SUBMIT A FINANCIAL DISCLOSURE STATEMENT WITH ADPCE
4. PAY A $100.00 PERMIT FEE WITH ADPCE.

ADPCE INFORMATION:

STORM WATER SECTION NPDES
LITTLE ROCK, ARKANSAS
PHONE: (501) 570-2150

CERT. CERTIFICATE OF AUTHORIZATION — MARLAR ENGINEERING CO., INC. — NO. 245 — ARKANSAS — ENGINEER

STATE OF ARKANSAS — REGISTERED PROFESSIONAL ENGINEER — No. 1917 — FORREST C. MARLAR, JR.

MEC INCORPORATED

MARLAR ENGINEERING CO., INC.
5318 John F. Kennedy Boulevard
North Little Rock, Arkansas 72116
Phone: (501) 753-1987

REVISION	DATE	DESCRIPTION	B

PROJECT: STONE LINKS ADDITION
INDEX MAP

TITLE: EROSION CONTROL PLAN

DRAWN BY:	DATE	JOB NUMBER:
LDJ	12-28-97	97-037
APPROVED BY:	SCALE	SHEET NUMBER 2 OF 29
FCM	1" = 100'	

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DRAINAGE DATA

Q = C I.A

Q = C F S I = INCHES PER HOUR A = ACRES

STRUCTURE	C	I25	A	Q25	I100	Q100	TOP ELEV	FLOW ELEV
F E S. # 1	0.6	3.0	3.0	5.4	4 2	7.5	-------	244 50
D I # 1	0.6	3.0	5.5	9.9	4.2	13.9	245.00	241 70
D I # 2	0 6	3.0	6 0	10 8	4.2	15.1	245.00	241 62
J B # 1	-------	-------	-------	-------	-------	-------	245.40	240.91
D I # 3	0.6	3.0	6 5	11 7	4.2	16.4	245 00	240 80
D I # 4	0.6	4 3	0.9	2.3	6 2	3 3	246.10	243 50
D I # 5	0 6	4 3	1.9	4.9	6.2	7 1	246 00	243 77
D I # 6	0 6	4.3	3 4	8.7	6 2	12.6	246 00	243 03
J B # 2	-------	-------	-------	-------	-------	-------	247 00	242 08
D I # 7	0.6	4.3	2 7	7 0	6.2	10.0	245 50	242 50
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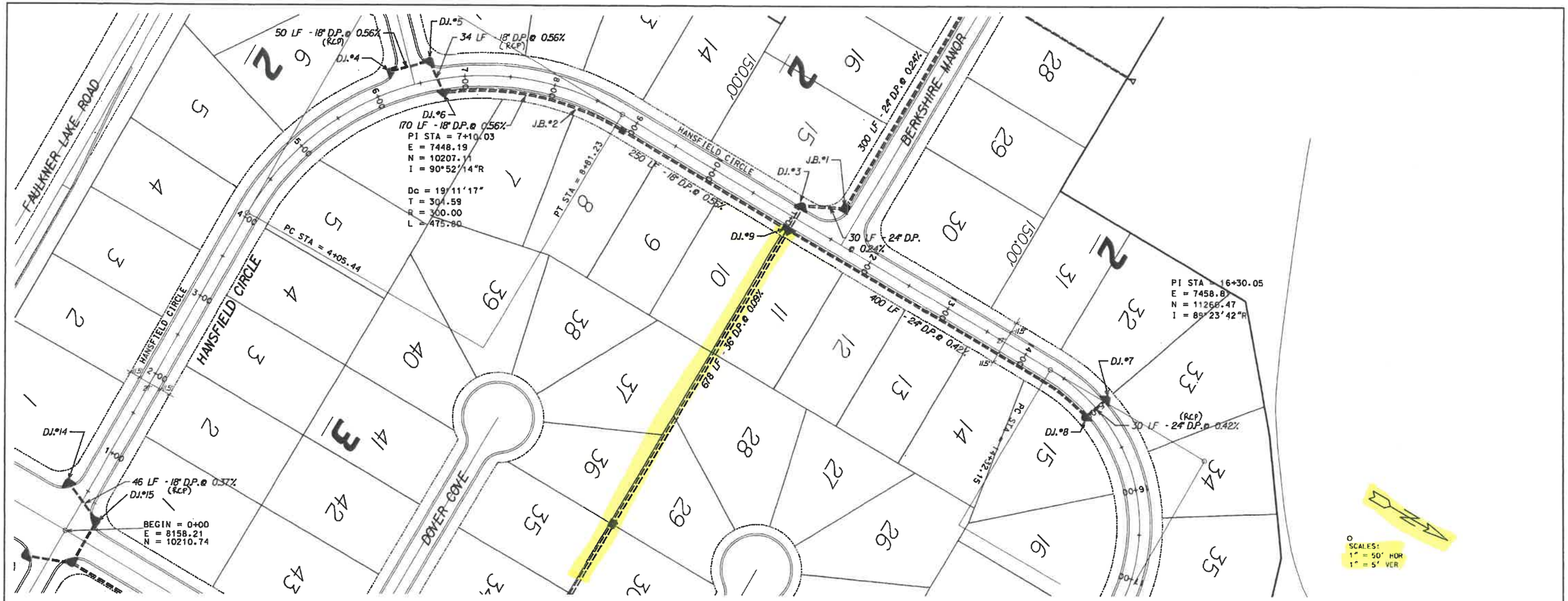
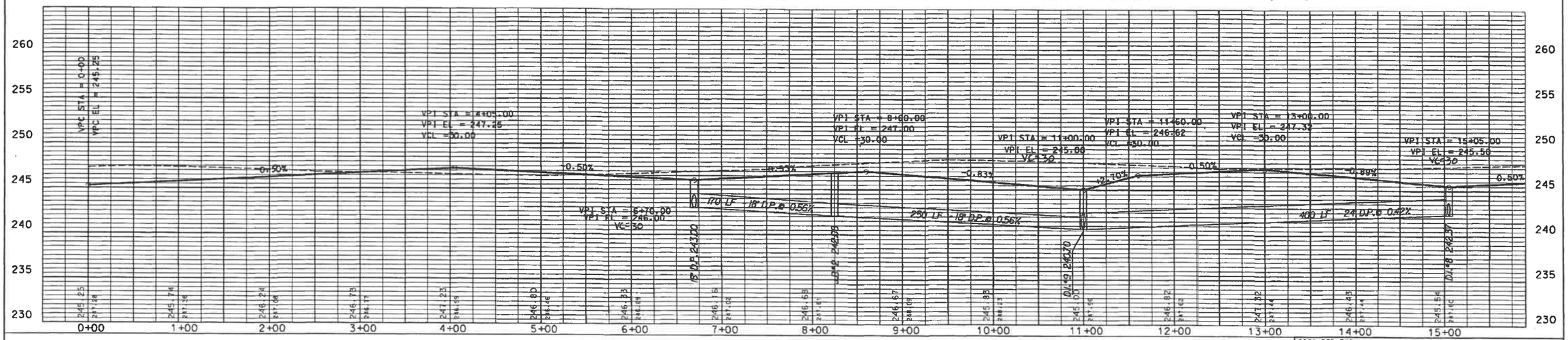
D I # 9	0.6	3 0	11.7	21.0	4.2	29 5	245 00	240.70
D I #10	0 6	4.3	0.9	2 3	6.2	3.3	246.60	243 80
D I #11	0 6	4 3	1.4	3.6	6 2	5.2	246 60	243.52
D I #12	0.6	4.3	3.6	9 3	6 2	13 4	244.65	242 10
D I #13	0 6	4 3	6 7	17 2	6.2	24.9	244.65	241 22
D I #14	0 6	5 0	0 9	2.7	7.0	3.8	245.00	242.25
D I #15	0 6	4.3	2 4	6 2	6.2	8.9	245 00	242.07
D I #16	0.6	5.0	1.2	3.1	7.0	5.0	245 00	242 25
D I #17	0 6	4 3	5.5	14.2	6 2	20.4	245 00	241.90
D I #18	0 6	4.3	2 1	5.4	6.2	7.8	245.40	241.90
D I #19	0 6	4 3	6.6	17.0	6 2	24 6	245.40	240.79
D I #20	0 6	3.0	20 6	37.1	4.2	51.9	243.85	240 10
D I #21	0 6	3.0	36 1	65.0	4.2	90.9	243 85	240 05





CERTIFICATE OF AUTHORIZATION — MARLAR ENGINEERING CO., INC. — No. 243 — ARKANSAS - ENGINEER

STATE OF ARKANSAS — REGISTERED PROFESSIONAL ENGINEER — No. 1917 — FOREST C. MARLAR, JR.

MARLAR ENGINEERING CO., INC.
INCORPORATED
5318 John F. Kennedy Boulevard
North Little Rock, Arkansas 72116
Phone: (501) 753-1987

REVISION	DATE	DESCRIPTION	BY

PREPARED FOR: STONE LINKS ADDTITON

TITLE: STREET & DRAINAGE PLAN / PROFILE
HANSFIELD CIRCLE

DRAWN BY:	DATE	JOB NUMBER:
LDJ		
APPROVED BY:	SCALE	SHEET NUMBER
FCM	AS SHOWN	5 OF 29

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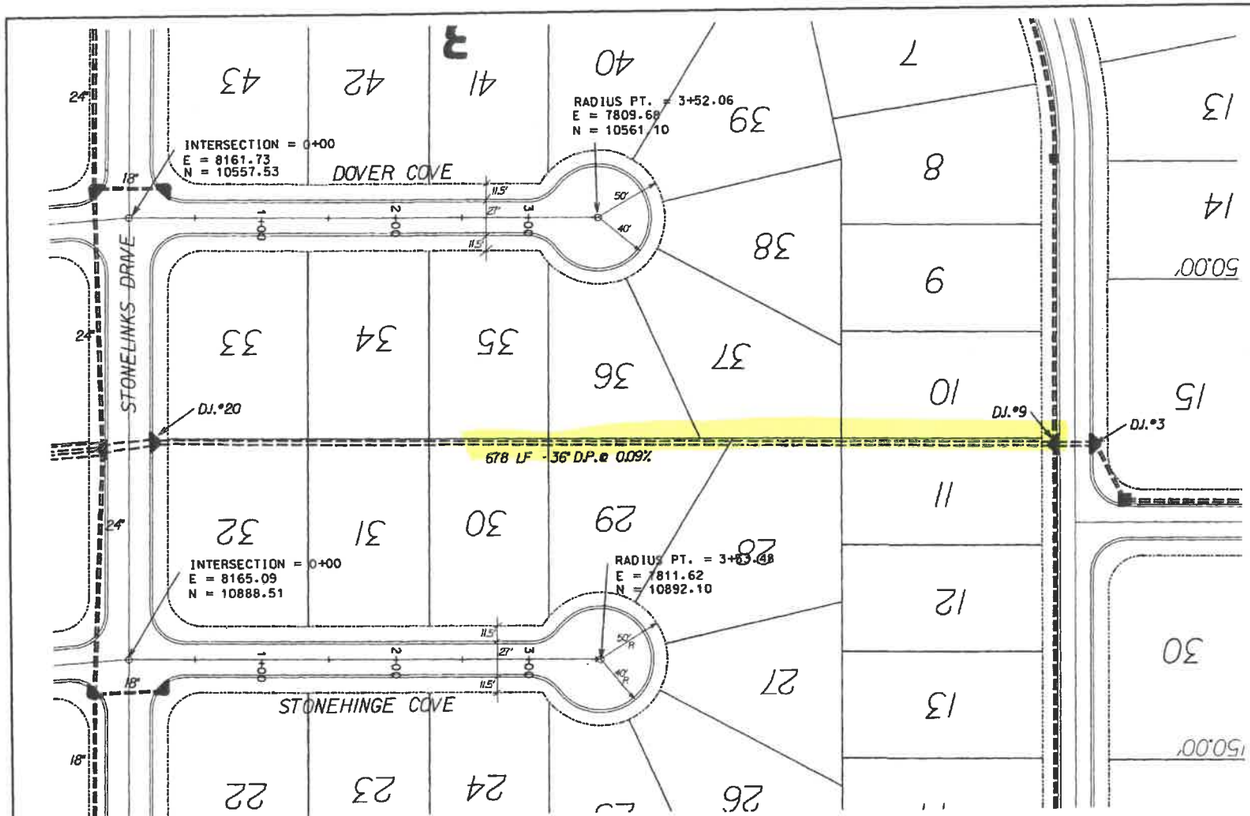

MARLAR ENGINEERING CO., INC.
CERTIFICATE OF AUTHORIZATION
ARKANSAS - ENGINEER
No. 243

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 1917
FORREST C. MARLAR, JR.

MARLAR ENGINEERING CO., INC.
INCORPORATED
5318 John F. Kennedy Boulevard
North Little Rock, Arkansas 72116
Phone: (501) 753-1987

REVISION	DATE	DESCRIPTION	BY

PREPARED FOR: STONE LINKS ADDTITON

TITLE: STREET & DRAINAGE PLAN / PROFILE
DOVER & STONEHINGE COVE

DRAWN BY:	DATE	JOB NUMBER:
LDJ	01-13-98	
APPROVED BY:	SCALE	SHEET NUMBER 9 OF 29
FCM	AS SHOWN	

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F.E.S.#1 - 18"

DJ.# 1

DJ.# 2

DJ.# 3

J.B.# 1

J.B.# 2

DJ.# 6

DJ.# 9

DJ.# 12

DJ.# 13

DJ.# 18

DJ.# 19

DJ.# 20

DJ.# 21

2 - 36"

STONEHINGE COVE

DOVER COVE

BROADSTONE

HARPENDEN

50'R

27'

24"

18"

36"

60'

36'

100 50 0 100 200FT

SCALE: 1"= 100'

60' X 150' BALLAST STONE CONSTRUCTION ENTRANCE

SCALES:
1" = 50' HOR
1" = 5' VER

HANSFIELD CIRCLE

BERKSHIRE MANOR

150.00'

BEGIN = 0+00
E = 7454.08
N = 10793.26

PC STA = 4+52.11
PT STA = 5+17.90

RP = 6+34.46
E = 6820.66
N = 10780.07

PI STA = 4+85.05
E = 6969.05
N = 10798.18
I = 7°32'18"L
Dc = 11°28'43"
T = 32.94
R = 499.99
L = 65.78

D.I.°9
D.I.°8
D.I.°2
D.I.°1
18" F.E.S.°1

300 LF - 24" D.P. @ 0.24%
30 LF OF 24" D.P.@ 0.24%
82 LF OF 18" D.P.@ 0.56%

ROYAL ASHDOWN MANOR

BEGIN = 0+00
E = 7538.54
N = 10297.06

RP = 1+27.54
E = 7448.13
N = 10207.11

D.I.° 4
D.I.° 5
D.I.°6

50 LF - 18" D.P.@ 0.56% (R.C.P.)
34 LF - 18" D.P.@ 0.56% (R.C.P.)

HANSFIELD CIRCLE

BERKSHIRE MANOR

VPC STA = 0+00
VPC EL = 246.62

-0.53%
0.56%

300 LF 24" DRAIN PIPE @ 0.24 %

VPI STA = 3+20.00
VPI EL = 245.08
VC = 40'

24" D.P. @ 0.24%

BVC = 6+54.46
EL = 245.77
EVC = 7+14.46
EVC EL = 247.00

18" D.P. @ 0.56%

ROYAL ASHDOWN MANOR

VPC STA = 0+00
VPC EL = 246.05

0.74%

BVC = 1+27.53
EL = 247.00
EVC = 1+67.53
EL = 247.30

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00

225 230 235 240 245 250 255 260

MARLAR ENGINEERING CO., INC.
5318 John F. Kennedy Boulevard
North Little Rock, Arkansas 72116
Phone: (501) 753-1987

CERTIFICATE OF AUTHORIZATION — MARLAR ENGINEERING CO., INC. — No. 243 — ARKANSAS - ENGINEER

STATE OF ARKANSAS — REGISTERED PROFESSIONAL ENGINEER — No. 1917 — FORREST C. MARLAR, JR.

REVISION	DATE	DESCRIPTION	BY

PREPARED FOR: STONE LINKS ADDTITON

TITLE: STREET & DRAINAGE PLAN / PROFILE
BERKSHIRE MANOR

DRAWN BY:	DATE	JOB NUMBER:
LDJ	01-13-98	
APPROVED BY:	SCALE	SHEET NUMBER
FCM	AS SHOWN	12 OF 29

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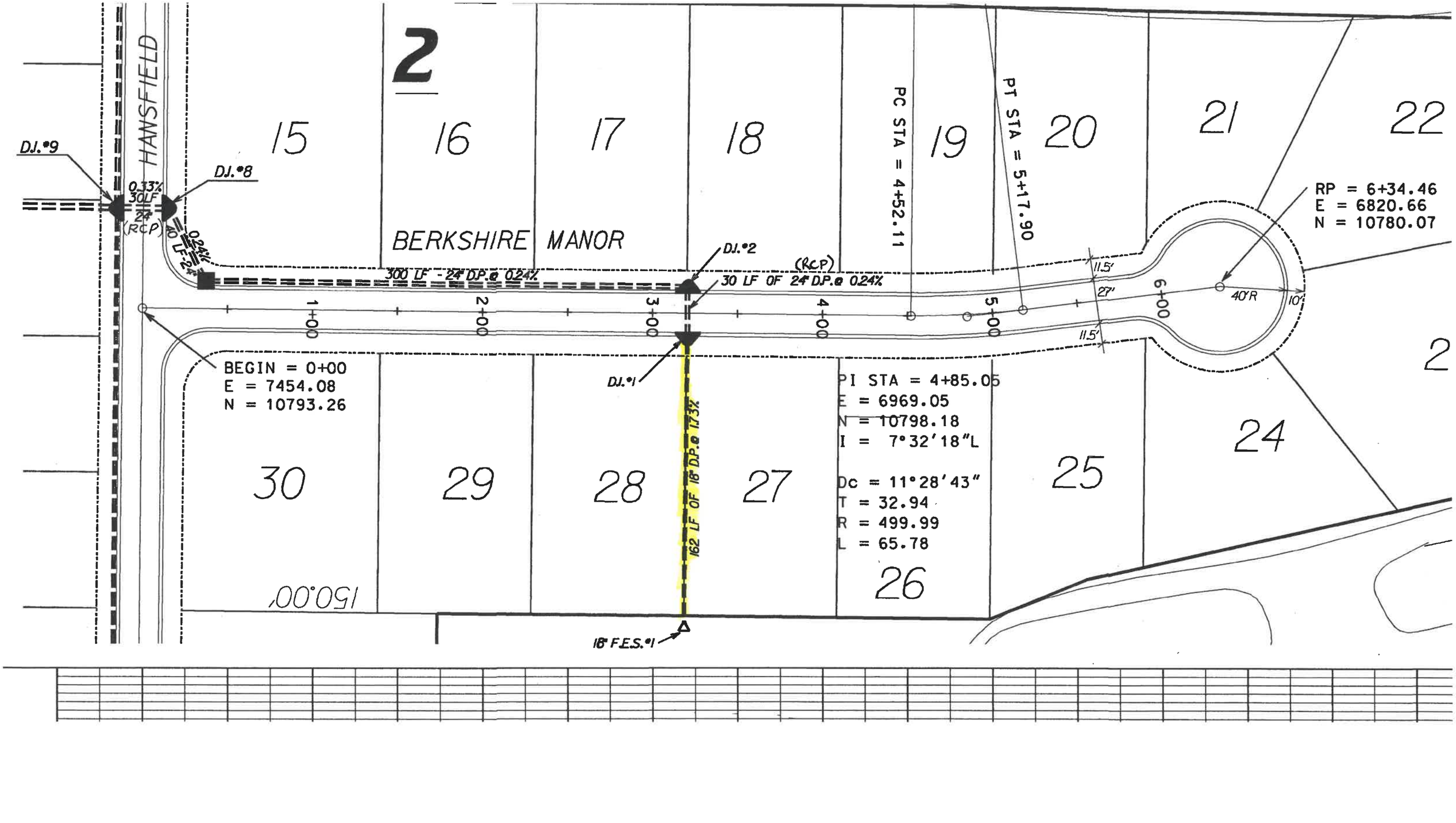
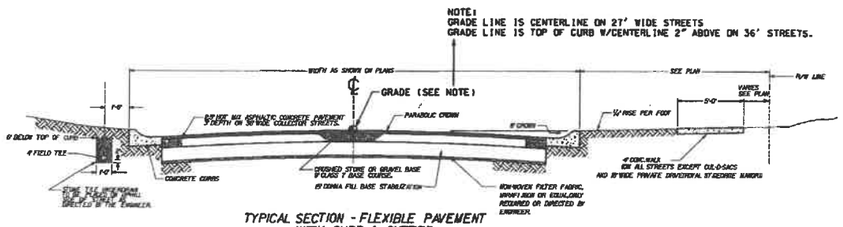
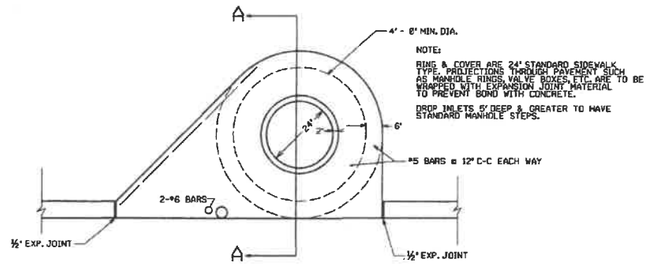

2
HANSFIELD
15
16
17
18
19
20
21
22
BERKSHIRE MANOR
PC STA = 4+52.11
PT STA = 5+17.90
DJ.#9
DJ.#8
0.33%
30 LF
24" (RCP)
0.24%
30 LF-24"
300 LF - 24" D.P.@ 0.24%
DJ.#2
(RCP)
30 LF OF 24" D.P.@ 0.24%
RP = 6+34.46
E = 6820.66
N = 10780.07
11.5'
27'
40'R
10'
1+00
2+00
3+00
4+00
5+00
6+00
BEGIN = 0+00
E = 7454.08
N = 10793.26
DJ.#1
PI STA = 4+85.05
E = 6969.05
N = 10798.18
I = 7°32'18"L
Dc = 11°28'43"
T = 32.94
R = 499.99
L = 65.78
162 LF OF 18" D.P.@ 1.73%
30
29
28
27
26
25
24
150.00'
18" F.E.S.#1

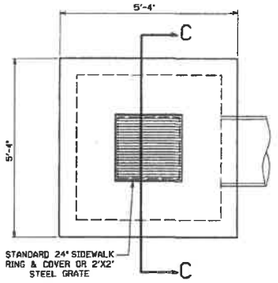


TYPICAL SECTION - FLEXIBLE PAVEMENT WITH CURB & GUTTER

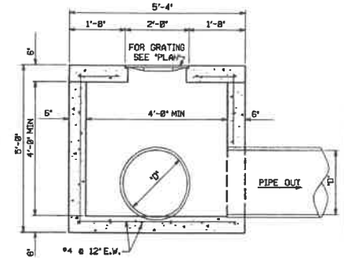
(NOT TO SCALE)



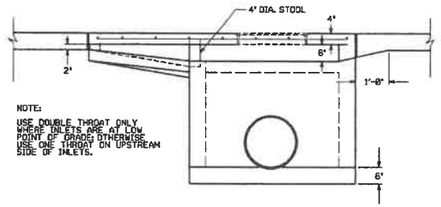
PLAN-SIDE INLET



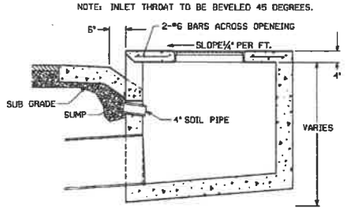
PLAN-CATCH BASIN OR JUNCTION BOX (AS REQUIRED)



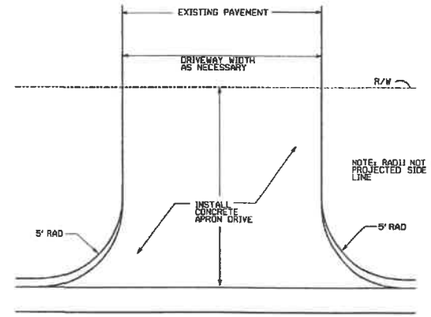
SECTION C-C



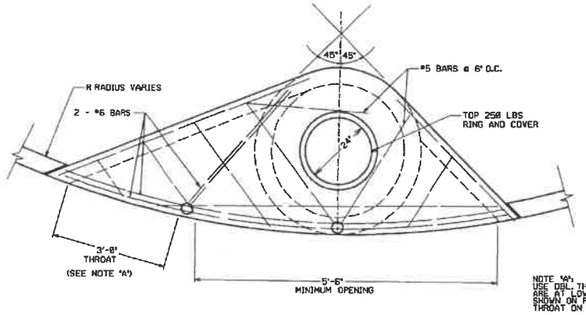
FRONT ELEVATION



INLET SECTION "A-A"

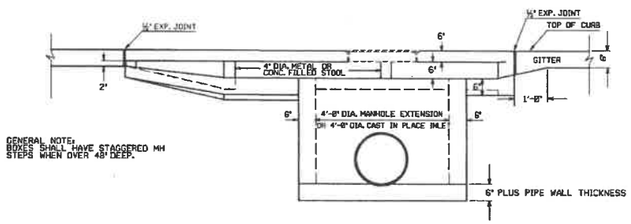


TYPICAL DRIVEWAY ENTRANCE PLAN



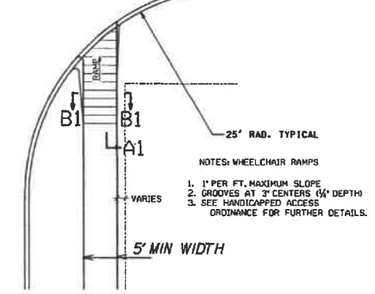
PLAN RADIAL INLET

NOTE "A":
USE DBL. THROAT ONLY WHERE INLETS ARE AT LOW POINT OF GRADE OR AS SHOWN ON PLANS, OTHERWISE USE ONE THROAT ON UPHILLSIDE OF INLETS.



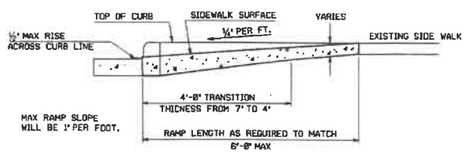
GENERAL NOTE:
BOXES SHALL HAVE STAGGERED MH STEPS WHEN OVER 4ft DEEP.

FRONT ELEVATION - RADIAL INLET



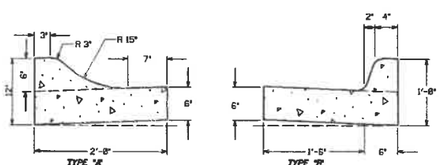
PLAN - WHEELCHAIR RAMP

SECTION B1-B1

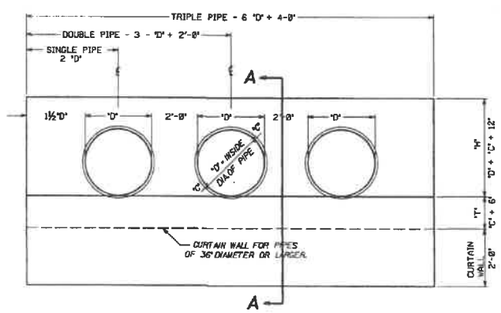


DETAILS - WHEELCHAIR RAMP
SECTION A1-A1

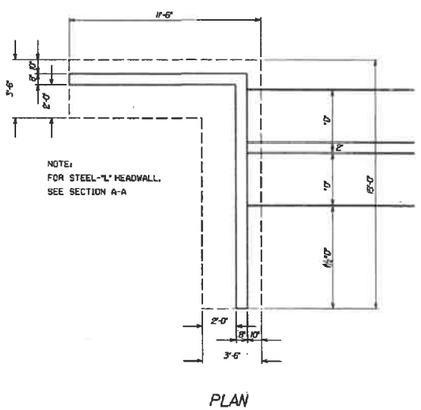
CURB INLET DETAILS



CURB AND GUTTER SECTIONS

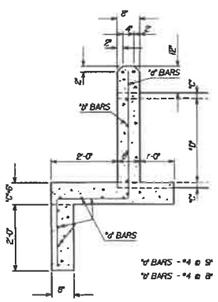


STRAIGHT TYPE HEADWALL END ELEVATION



"L" TYPE HEADWALL

PLAN



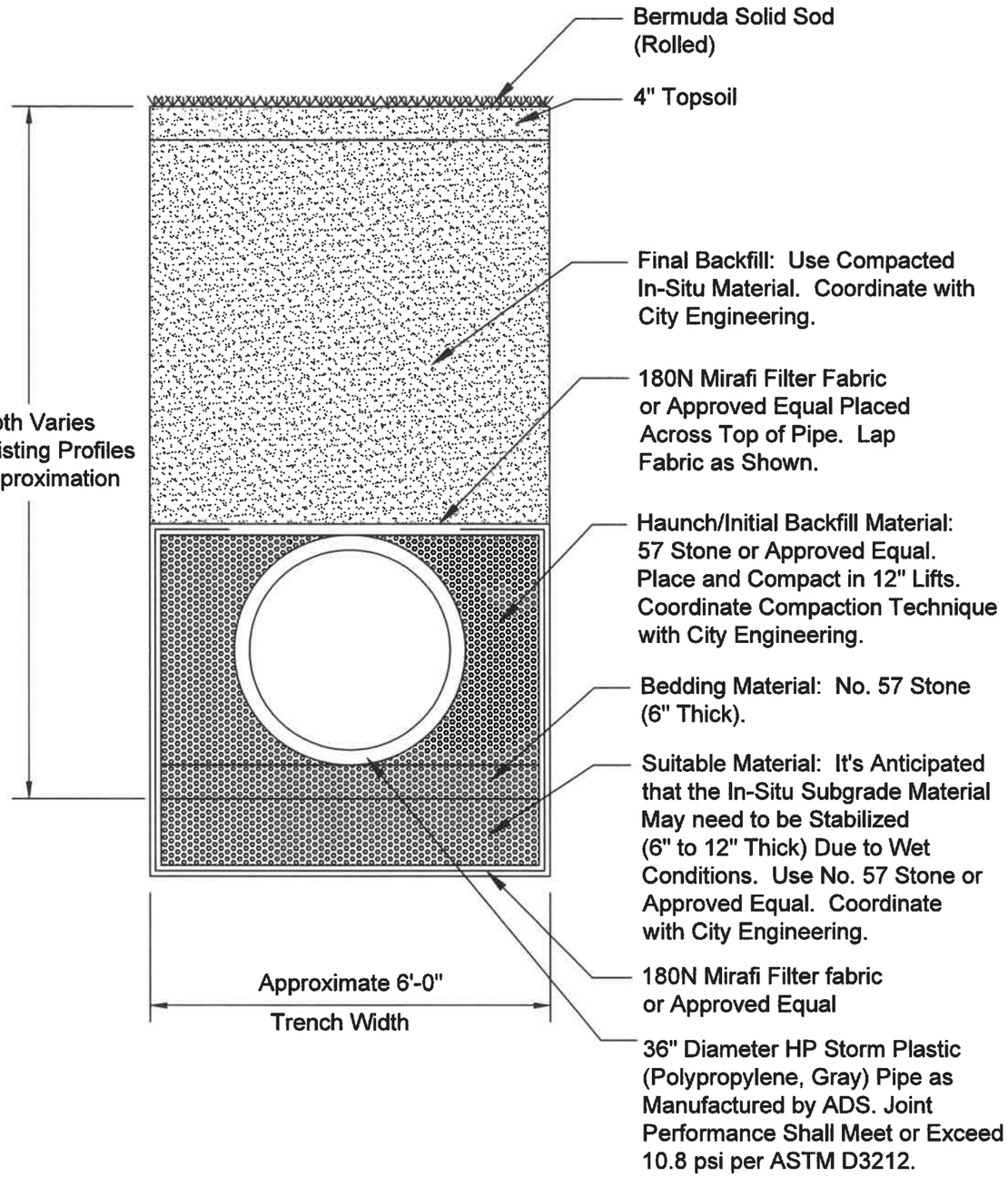
SECTION A-A

STONE LINKS
STANDARD DETAILS FOR PAVING CONSTRUCTION

REVISION	DATE	DESCRIPTION	B

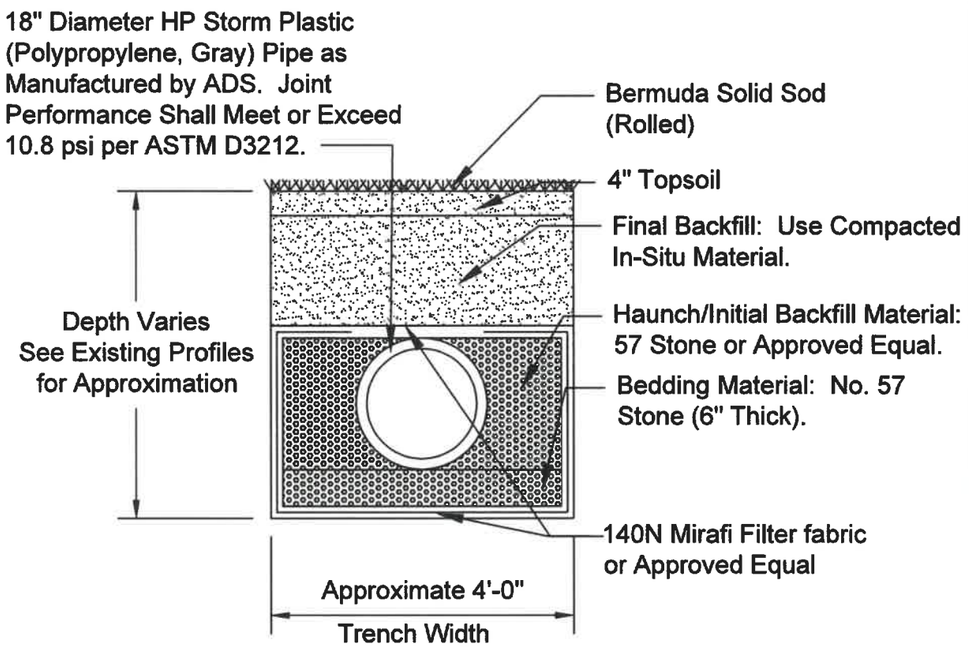
MARLAR ENGINEERING CO., INC.
5318 John F. Kennedy Boulevard
North Little Rock, Arkansas 72116
Phone: (501) 753-1987

DRAWN BY:	DATE	JOB NUMBER:
LDJ		
APPROVED BY:	SCALE	SHEET NUMBER 15 OF 29
FCM	AS SHOWN	



36" DIA. PLASTIC PIPE BEDDING DTL.

SCALE: 1/2"=1'-0"



18" DIA. PLASTIC PIPE BEDDING DTL.

SCALE: 1/2"=1'-0"

NOTES:

1. Plastic Pipe Systems Shall be Installed in Accordance With ASTM D2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications", Latest Edition. Soil Classifications are per the latest Version of ASTM D2321. Class IVB materials (MH, CH) as Defined in in Previous Versions of ASTM D2321 are not Appropriate Backfill Material.
2. Where the Trench Bottom is Unstable, the Contractor Shall Excavate to a depth Required by City Engineering and Replaced with Suitable Material. As shown in the Bedding Details, it's likely Stabilization of the In-Situ material at the Bottom of the Trench will be Necessary.
3. As Detailed, measures will be taken to Prevent Migration of Native Fines into Backfill Materials.

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

STONE LINKS MULTI-PIPE MAINTENANCE REHABILITATION

PLASTIC PIPE BEDDING DETAILS

DATE: 5/2021
DESIGNED BY: DCW
DRAWN BY: DCW
SCALE: 1/2" = 1'-0"

SHEET NUMBER
11